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U.S. RADIO FARM SCHOOL

U.S. DEPARTMENT OF
AGRICULTURE

OFFICE OF INFORMATION—RADIO SERVICE

Poultry Short Course No. 1

FALL POULTRY MANAGEMENT PROBLEMS

October 6-November 24
1926



*By M. A. JULL, Poultry Husbandman
Bureau of Animal Industry*



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Radio Stations Broadcasting the U. S. Farm School

(Scheduled on Monday, Wednesday, and Friday, unless otherwise specified)

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OCTOBER 6—NOVEMBER 24
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This is the first group of printed lessons supplementing the U. S. Radio Farm School talks from broadcasting stations listed on inside of cover. All regularly enrolled students in the livestock, poultry, and dairy sections will be furnished the full series of booklets. These publications are mailed at the completion of each short course

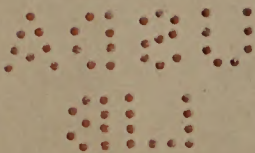


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Contents

	Page
Lesson 1. Selecting pullets and putting them in their laying quarters -----	1
Lesson 2. Culling the laying flock -----	2
Lesson 3. Feeding the layers -----	3
Lesson 4. Protein, green feed, milk, and minerals in poultry feeding -----	5
Lesson 5. Fattening chickens for market -----	8
Lesson 6. Killing and plucking chickens -----	9
Lesson 7. Marketing turkeys -----	11
Lesson 8. Marketing ducks and geese -----	13

(II)



FALL POULTRY MANAGEMENT PROBLEMS

Lesson I. Selecting Pullets and Putting Them in Their Laying Quarters

During September and October the laying hens usually go through the molt, during which time egg production decreases but prices of eggs are on the increase.

It is very desirable therefore to get the pullets into egg production as soon as possible. The more eggs the pullets lay in the fall of the year the greater the profits.

Put the pullets into their laying quarters about one month before they are ready to lay.

Select the pullets carefully, because a poor pullet will be a source of loss instead of profit. If you have a flock of 200 pullets it may pay well to put only 150 of the best in the laying house rather than the entire 200, because 50 of these might prove to be poor producers. A careful culling of the pullets before putting them in the laying house will pay well.

Cull the Pullets Carefully

Select only healthy, vigorous pullets that have grown well and have good body size. Select those with bright, full eyes, good width of the head and back, and good depth of body, and with bright yellow pigmentation.

Early maturing pullets make the best layers. Leghorns should commence laying at about 5 months of age and heavier breeds at about 6 months.

The pullets should also be culled carefully according to the standard qualities of the breed. Single-comb breeds should not have side sprigs, which are little projections on the side of the comb, and all clean-legged breeds should be free from stubs—feathers growing between the scales on the shanks and toes.

These are standard disqualifications, and unless some attention is paid to them the whole flock will soon lose much of its breeding value.

Great care should be used in selecting pullets reasonably true to breed type and of good color. Plymouth Rocks, for instance, should not be of the Leghorn type. White birds should not show brassiness or colored feathers, and colored birds should be of as nearly standard color as possible.

At the time of culling the pullets handle them as carefully as possible. Have the laying house thoroughly cleaned and disinfected ready for the pullets and just before they are put in the house rub a few pinches of commercial sodium fluoride over different parts of the body of each bird to free them of lice.

Keep the pullets in their new quarters for at least one night, and just before roosting time on the second day they can be let out if they are to be given any range.

Lesson 2. Culling the Laying Flock

Cull the laying stock to remove the poorest layers and save the best for layers the second year.

Egg production decreases about 25 per cent each succeeding year, but hens that laid poorly as pullets will decrease in production faster than hens which laid well in their first year.

Leghorns usually maintain better production in the second laying year than heavier breeds, but all flocks should have about half the number culled.

Culling saves feed and improves the quality of the yearlings, which will be used as breeders the next spring.

Points to Keep in Mind When Culling

In culling the laying flock keep the following things in mind:

Poor layers usually molt earlier than good layers.

Poor layers show much more yellow in their beak and shanks than good layers, the natural yellow pigment being bleached out after a hen has laid well.

Good layers usually have a bright, full eye, good width of head, good width and depth of body, but not tending to sag down behind.

The skin over the body of a good layer is thin and of fine texture, while that of the poor layer is frequently thick and coarse in texture.

Leghorn hens to be saved should weigh at least 4 pounds each.

Plymouth Rocks, Rhode Island Reds, and Wyandottes to be saved should weigh from 5 to 6 pounds each.

Lesson 3. Feeding the Layers

The all-important problem in feeding laying hens is to get the largest possible returns in egg production at the least possible expense. The cost of the feed consumed and the price of eggs are therefore the two most important factors determining profits in egg production. The farmer can not very well control prices, but he can control egg production. Every farmer knows that egg prices are highest during the fall and early winter months, and he should realize that if he gets good egg production then it will pay him well. Fall and early winter production is the keynote to greatest profits. Pullets should commence laying in October or early November.

Give the Right Kind of Feeds

The pullets can not be expected to make eggs unless they are fed egg-making feeds in abundance. Manufacturing eggs means hard work for the hen, and she must have plenty of the right kind of feed. Of course, to lay well the pullets must first be the bred-to-lay kind. Good feed without good breeding is largely wasted.

A hen laying 144 eggs in one year produces 18 pounds of material if the eggs are of standard weight, so that a hen weighing 5 pounds would produce more than three times her own body weight in eggs. Help the hen all you can by giving her the right kinds of feed in proper quantities and in the way best suited to her needs.

Laying hens need grain, meat food, green food, minerals, and plenty to drink. The grain part of the ration should be fed as scratch grain and mash, half and half. Under average conditions 100 hens will eat about 12 pounds of scratch grain and 12 pounds of mash daily.

A Home-Mixed Scratch Ration

The scratch ration, during the winter months, should be 2 parts corn and 1 part each of wheat and oats, provided you can get oats of good quality; if not, then use a scratch ration of 2 parts corn to 1 of wheat.

Feed the scratch ration twice daily, first thing in the morning and last thing in the afternoon, just enough in the morning to keep them scratching for half an hour or so but in the afternoon give them all they will pick up clean before going to roost. Always scatter the scratch ration all through the litter so that the hens have to scratch for it; exercise makes eggs and helps to keep the hens in good health.

Some kind of mash ration is necessary if best results in egg production are expected. Giving mash induces the layers to eat more grain and this in turn makes more eggs.

Feeding the mash dry in self-feeding hoppers saves labor, and this is an important factor with a large flock. With a small flock wet mash may be fed daily in V-shaped troughs. The big advantage in feeding a mash ration made up of ground grains is that more protein can be added to the hen's diet.

The egg is relatively rich in protein and the laying hen needs more than is supplied in the ordinary grains. Minerals can also be added to the mash ration and mineral food is necessary for the manufacture of egg shells as well as for bone growth and replacement of worn-out tissues.

A Home-Mixed Mash Ration

The poultryman may mix his own mash ration or purchase one of the good commercial laying mashes

on the market. A good mash ration is as follows: Corn meal, 440 pounds; bran, 100 pounds; middlings, 100 pounds; crushed oats, 100 pounds; ground alfalfa, 100 pounds; meat scraps, 100 pounds; bone meal, 25 pounds; ground limestone, 25 pounds; and salt, 10 pounds. That makes 1,000 pounds in all, provides variety, and supplies protein and minerals.

Besides the scratch and mash rations, laying hens should be given plenty of green feed, such as sprouted oats, oyster shell, grit, and plenty of water to drink. Milk is also an excellent food for laying hens and should be given in some form. If you have plenty of skim milk from the dairy herd, give the hens skim milk to drink every day.

If skim milk is not available then purchase some form of prepared milk, such as semisolid buttermilk, dried skim milk, or dried buttermilk. The semisolid product may be fed daily in V-shaped troughs at the rate of 3 pounds for every 100 layers. The dried products can be added to the mash ration given above at the rate of 50 pounds for every 1,000 pounds of mash. In some respects nothing can take the place of milk for laying hens.

Feed regularly and try to keep the layers up in body weight without getting them too fat. Maximum egg production depends not alone on the kinds of feed but as well upon the method of feeding.

Lesson 4. Protein, Green Feed, Milk, and Minerals in Poultry Feeding

The raw products consumed by fowls are used in repairing waste and in providing materials for the production of eggs and poultry meat. The raw products must contain, then, the materials out of which poultry meat and eggs are made.

Poultry flesh consists of water, salts, proteins, carbohydrates, fats, and other organic substances. Eggs consist of albumen and yolk. The albumen contains over 87 per cent water and nearly 11 per cent protein. The yolk contains about 50 per cent water and about 50 per cent solids.

The three constituents of chief importance in feeding practices are protein, minerals, and vitamins. Of these, protein is the most important, simply because it is the most difficult to get in sufficient quantities.

Animal Protein is Superior

The egg is so rich in protein that the staple grains do not contain enough of it and additional supplies must be obtained from other sources. In thus supplementing the grains it should be remembered that animal protein is superior to vegetable protein.

Practical experience has shown that the mash part of the ration should contain about 20 per cent of meat scrap or its equivalent.

Skim milk is also a valuable source of supply of protein and vitamins, and it seems to keep the laying stock in good condition. Whenever milk is obtainable at a reasonable price—probably up to 60 cents a hundred pounds—as much should be provided as will be used up before souring.

Alfalfa is Most Valuable Green Food

Even when mangels, turnips, or cabbages are fed daily, the chickens do not get enough green feed. Mangels and turnips provide some succulence, but very little green food. Cabbages are not nearly so good as well-cured alfalfa.

When cabbages are available at reasonable cost, some may be fed every day, but good-quality alfalfa also should be supplied. Alfalfa is valuable, not so much because of its protein content, as formerly believed, but because alfalfa leaves are rich in minerals and vitamins, which are lacking in the mash ration.

The minerals contained in alfalfa leaves supplement the inorganic deficiencies of the grains, and the fact that alfalfa is also rich in vitamin A makes it doubly valuable for winter egg production. Recent

experiments have shown that sprouted oats are not so valuable as has been claimed for them when the sprouts are allowed to get 2 or 3 inches long. Germinated oats, when the sprouts have just started, are much better than the green sprouts, because this germinated grain enables the laying hen to digest her other feed more efficiently.

Besides the easily digestible protein of milk and the valuable mineral elements which it contains, the lactic acid which develops acts as a stimulant and helps to prevent intestinal troubles. If skim milk is not available, either powdered skim milk or powdered buttermilk should be incorporated in the mash.

Steamed Bone Meal Supplies Lime

Then to make sure that the laying hen receives enough of the minerals—of which she needs more in proportion to her body size than any other animal—add a good grade of steamed bone meal to the ration.

Lime and phosphorus are two minerals contained in steamed bone meal, which are very important in feeding for egg production, and the content of from 45 to 50 per cent of phosphate of lime from bones serves the hen well in building up her skeleton and furnishing feathers as well as in making eggs.

A ration that is too rich in concentrated feeds is too forcing, and in the past not nearly enough attention has been given to the mineral supply. Farmers and commercial poultrymen should never forget that laying hens need more minerals than do other animals.

Did you ever hear of the farmer who said he would not waste grain on his chickens because they would not lay, forgetting all the time that they did not lay because he did not feed them? Do you adopt the same attitude toward your chickens in respect to the mineral supply as well as proteins and vitamins? Do not deny hens any of the necessary elements.

Lesson 5. Fattening Chickens for Market

The weight of growing chickens, as well as the quality of their flesh, can be greatly improved by a short fattening period before they are marketed. Mature hens are usually in fair flesh and do not make profitable gains in fattening unless they are unusually thin.

The most common method of fattening chickens while on range is to increase the corn and corn meal in the ration and feed them heavily for a period of one to three weeks.

Pen fattening is used to furnish high-class table poultry for retail trade. In this method 30 to 50 chickens may be confined to a pen, with or without a small yard, and fed heavily on a fattening ration for from two to three weeks.

A good fattening mash may be composed of 2 parts corn meal and 1 part middlings, by weight, fed with skim milk or buttermilk. The mash should be mixed to a crumbly consistence.

Milk is very desirable in fattening, but if it is not available use a mash of 1 part bran, 1 part middlings, 3 parts corn meal, and one-fourth part meat scrap, by weight, and supply green feed to the chickens. The fattening mash should be fed twice daily, morning and afternoon, and, in addition, a light feed of cracked corn should be given late in the afternoon.

Water and grit should be kept before the chickens all the time. It takes from 3 to 4 pounds of grain to make a pound of gain in pen fattening, if the feed is mixed with milk. When water is used, from 6½ to 7½ pounds of grain are required to make a pound of gain.

Crate Fattening Confined to Packing Houses

Crate fattening is the method used in packing houses where large numbers of chickens are fattened each year. It is also used on a smaller scale in farm fattening of poultry for high-class retail trade. The chickens are confined in batteries, usually arranged in tiers, with 8 to 10 chickens in each compartment.

The fattening ration is always made of about 60 per cent milk, which is mixed with a grain mixture of about 3 parts corn meal and 2 parts oatmeal. Oat groats, oat middlings, and low-grade wheat flour may be used in place of the rolled oats, and 5 to 8 per cent of wheat middlings or bran may be added to these rations.

The feed is mixed to the consistence of porridge and is usually fed three or four times daily. These chickens are fattened in from 7 to 17 days and are called milk-fed chickens. About $3\frac{1}{4}$ pounds of grain mixed with 2 pounds of milk are required to make a pound of gain in crate fattening under commercial conditions.

When the chickens are first confined for fattening, they should be fed lightly for two to three days; after this as much feed should be given as they will clean up in 30 minutes. The last meal of the day should be the heaviest feed, and the chickens can be fed more heavily toward the end of the fattening period. Small chickens give the best results on the longer feeding periods; the length of fattening should be decreased as the weight of the chickens to be fattened increases.

Lesson 6. Killing and Plucking Chickens

The appearance and condition of dressed poultry depend greatly on the care used in the killing, picking, and cooling. Chickens should be dressed for market only when the weather is cool, when the birds are to be sold for immediate consumption, or when it will take only a few hours to reach the market. No solid food should be given the chickens for 24 hours before killing, but plenty of water should be supplied.

Market poultry should be killed by sticking the chicken in the throat so that the head is not cut off. A simple method of killing is to loop a cord around both legs and hang the bird head down. The head is grasped in the left hand, the mouth opened and the jugular vein is cut in the throat just below the base of the skull with one slash of a sharp, narrow-bladed knife.

Care in making the cut and in hanging the bird head down will produce a well-bled carcass. Poorly bled chickens are unattractive in appearance and do not keep well.

Dry=Picked Fowls Appear Better

Fowls may be either dry picked or scalded after they are killed. Dry picking is more difficult than scald picking, but the dry picking produces a much more attractive fowl, which brings a premium in some markets. The demands of the market should be considered in deciding whether to dry pick or scald the fowls.

In dry picking the chicken should be brained or stuck by pushing the point of the knife through the roof of the mouth into the brain immediately after the jugular vein is cut. As soon as the bird is stuck a blood can, or a weight, should be hooked to the lower bill of the bird and the feathers immediately plucked. If plucking is not done at once the feathers are much harder to remove. The large tail and wing feathers are pulled first; then the feathers from the breast, sides, thighs, legs, hip, and back; then come the neck feathers; with the small wing feathers last.

The feathers should be pulled in the direction in which they lie to prevent tears. After the larger feathers are plucked, the pin feathers are removed. If the crop contains much food, it should be cut open and emptied.

Chickens to be scald picked should be killed by braining with a knife. After they are hung up and thoroughly bled they are held by the head and feet and plunged into water which is almost but not quite boiling.

Short Time in Scalding Water

They are moved about in the water so that it penetrates through the feathers, but should be scalded only long enough to make the feathers pull easily. Longer scalding makes the carcasses very unattractive and

lowers the keeping quality. After being scalded and picked, the fowls should be dipped in hot water and then in cold water, which gives them a plumper appearance.

Chickens must be cooled promptly after plucking, whether they are dry picked or scalded. This is generally done by putting the carcasses into iced or cooled water, or by cooling in the air, if the weather is cold, until the body heat is removed. The cooling is done by refrigeration when it is available, which is much better than cooling in water.

Lesson 7. Marketing Turkeys

Since turkeys are in greatest demand during the Thanksgiving and Christmas holidays the largest portion of the annual turkey crop is disposed of at these seasons. The remainder is sold to the hotel and restaurant trade during the rest of the year; and the turkeys are usually put into storage and taken out as needed.

Vigorous young turkeys of a standard variety will make weights of from 12 to 20 pounds at 5 or 6 months of age provided they have been well fed and cared for.

There is usually an excellent general demand for medium-sized birds, but turkeys of extra large size should be marketed during the holiday season when they will usually bring better prices than when sold to the hotel trade.

The turkey raiser should market most of the birds found in good flesh at Thanksgiving time, but some of the quick-growing, thrifty birds should be held for breeders, as health and vigor in the stock are the foundation of success.

Turkey Day is a Big Event

Farmers living near city markets can dress their own turkeys and sell them direct to consumers or retailers. In certain sections the local growers mar-

ket their annual crop of turkeys just before Thanksgiving on a day known as "turkey day." On the day before this event every turkey grower kills and dresses his turkeys, and on the following day he brings them into town for sale to visiting buyers. When sold in this way the turkeys should be dry picked.

It is poor practice to shut turkeys up in a small pen or inclosure for fattening, as the confinement causes loss of appetite and flesh; the birds should be allowed free range under usual conditions.

Fattening should begin about October 1 and the birds gradually accustomed to larger quantities of feed. They can be fed twice daily, morning and night, until about a week before sending them to market, when they should be given all they will clean up three times a day.

Care must be taken, however, not to overfeed during the fattening period; the appetite must be kept on edge so that the birds will continue to eat freely. If overfed, the birds are likely to be thrown "off feed" for several days. A variety of wheat, oats, and corn will give best results. Old corn, if free from mustiness, is preferable to new corn.

Most Turkeys are Sold Alive

Except for local trade the bulk of the turkey crop is sold alive. The farmer may ship birds by express to a near-by market, consigning his turkeys to a poultry produce firm or poultry buyer.

Coops not more than 16 to 20 inches high should be used, as the birds are likely to get on top of one another in higher coops. In sections of the Middle West and Southwest flocks of turkeys are sometimes driven many miles to a killing station.

Turkeys should be killed and dressed as soon as possible after arrival at their destination, as they fret under confinement and shrink rapidly in weight. No feed should be given for at least 12 hours before killing, but they should have clean, fresh water to clean out the crop, stomach, and intestines.

When ready for killing, place a cord about the legs and hang the bird head down; with a sharp-

FALL POULTRY MANAGEMENT PROBLEMS 13

edged, narrow-bladed killing knife cut the veins of the throat at the rear edge of the skull. If properly done, this results in free bleeding.

The picker can then proceed to stick the bird, piercing the brain by plunging the knife through the groove in the roof of the mouth to a point between and a little back of the eyes. A slight twist of the knife at this point usually causes a convulsive twist of the muscles; this loosens the feathers and makes dry-picking easy.

The large feathers of the wings and tail are removed first, followed by body feathers.

Remove the body heat by thorough cooling, which usually takes from 12 to 24 hours, when the birds may be graded and packed in suitable containers for market. Proper methods of killing and dressing are essential in producing high-class, market turkeys.

Lesson 8. Marketing Ducks and Geese

As an industry the production of ducks is confined chiefly to the raising of ducks on commercial farms for duck meat, and in a smaller way to the raising of ducks for the same purpose as a side line on general farms.

The breeding of ducks for egg production has never become very extensive in the United States since there is a comparatively small demand for their eggs. The sale of ducks for exhibition purposes is an extremely small percentage of the total number sold, as the competition in exhibiting ducks is not so keen as in chickens.

Commercial Production Confined to Few Localities

Commercial duck farming is carried on in sections adjacent to good city markets. There are a number of duck farms located in the New England States and there are a few on the Pacific coast.

Long Island, however, has the great majority, since there is a great demand for ducks in New York City. Through a cooperative association known as the Long Island Duck Growers (Inc.), full advantage

can be taken of the near-by markets by use of storage facilities and orderly marketing practices. There is also mutual help in the cooperative purchase of general supplies and feed. One or two large growers in Massachusetts market their entire duck crop at roadside inns.

The rearing of ducks for market is done on the intensive plan. Young ducks are forced for rapid growth and are marketed at from 8 to 12 weeks of age as "green ducks," when they weigh from $4\frac{1}{2}$ to 6 pounds. At 7 or 8 weeks the young ducks are fed a fattening ration until marketed.

A ration suitable for this fattening period is: 4 parts corn meal, 2 parts bran, 2 parts meat scrap, 2 parts middlings, and 1 part green feed, parts by weight. When ducklings are well grown and have reached weights of 5 to 6 pounds they are in prime condition and should be marketed promptly. If held until the molting of the first feathers is well under way, they are apt to lose weight; usually the ducklings are marketed within one week after they begin to molt. When the duckling's body has a good smooth breast so that the breastbone can not be readily felt, the bird is ready for killing.

Dry Picking Not Generally Practiced

On the average duck farm the birds are not dry picked but are scalded to aid in removing the feathers and down. With a long, narrow-bladed knife the veins in the throat just beyond the skull are severed; this will cause free bleeding.

Then the ducks are scalded by immersion in water maintained at a temperature just below boiling. Care must be taken to avoid discoloration of head and feet, and these parts should be kept out of the water.

If dry picking is demanded, the ducks must be handled in the same way as in the dry picking of chickens; that is, after bleeding the knife is plunged into the brain through the groove in the roof of the mouth. This causes paralysis of the muscles and makes the picking easier.

The ducks should be cooled promptly and thoroughly, after which they can be packed in ice for shipping. The best prices are usually obtained from March 1 to May 1; prices drop somewhat during the period of heaviest shipments in the summer months, rising again in September, when the duck shipments fall off.

As the farmer has no special market most of the farm-raised ducks are held until fall and then sold alive. If there is a special local demand for ducklings, however, it will pay the farmer to dress and deliver them.

Geese are Holiday Birds

The best time to market geese is during the Thanksgiving and Christmas holidays, although geese are marketed throughout the year. There is also a limited demand for "green geese" corresponding to the trade in "green ducks." Green geese are goslings from 12 to 16 weeks of age which are forced for rapid growth until a weight of about 10 pounds is reached. The best markets are the large cities, particularly cities where there is a large foreign population. There seems to be some native prejudice against the goose as being too greasy; but roast goose is a most delectable dish if excess fat is removed.

Many geese are marketed without any attempt to fatten them; but the increased prices received for well-fattened geese makes it well worth while to finish them properly. Pen fattening is the method best adapted to small lots of geese on the average farm. Not more than 20 to 25 geese should be penned together for this purpose. These can be fed a moist mash once daily, consisting of 1 part shorts and 2 parts corn meal, and two feeds of corn with some oats or barley.

If possible, the pens should be kept partly darkened and the geese disturbed very little. An increase of from 4 to 6 pounds in weight may be obtained in this way.

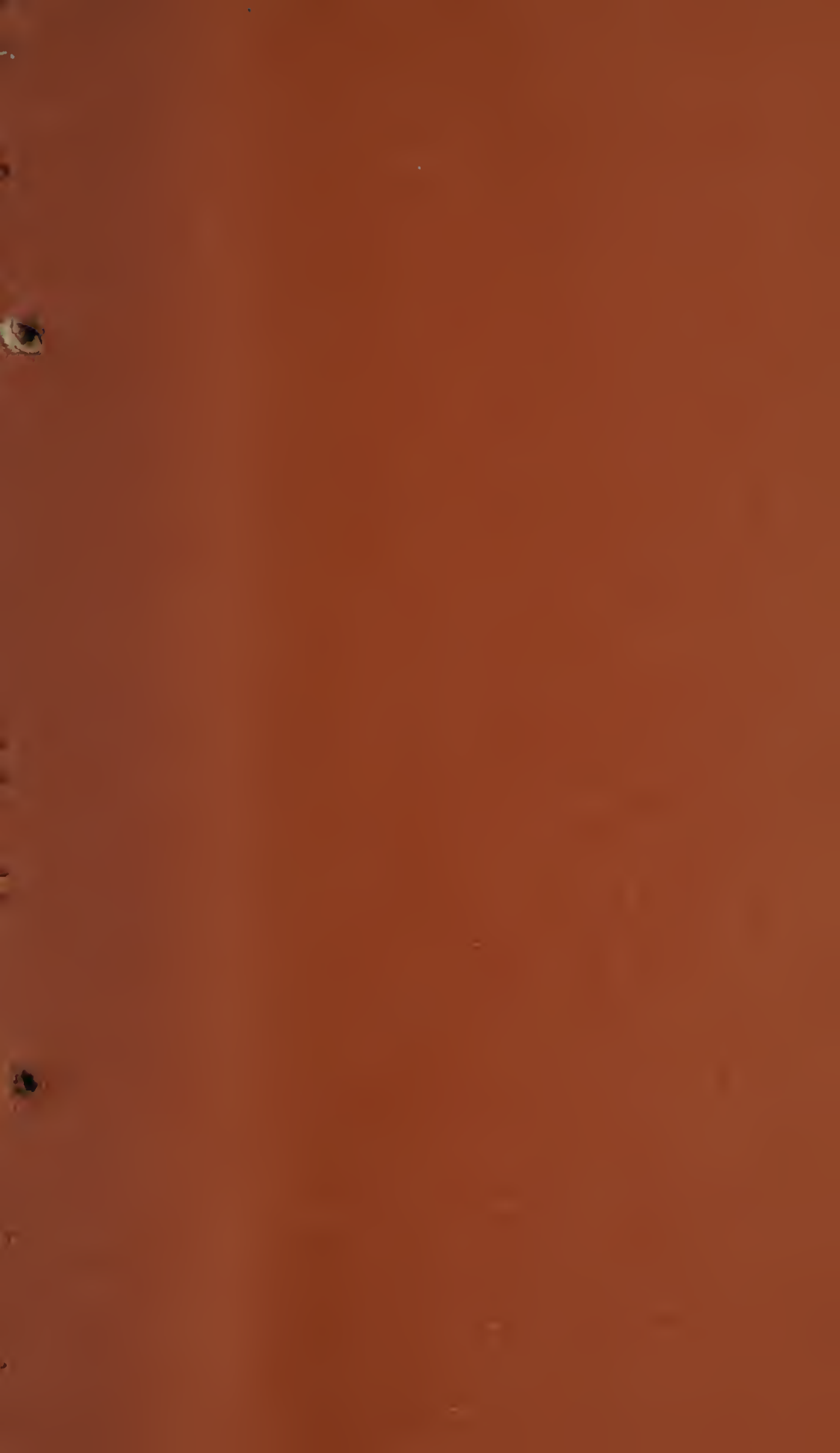
Hand Feeding Produces Highest Quality

Noodling, or hand feeding, is designed to produce fattened geese of the highest quality. The large geese are stuffed with noodles for 3 or 4 weeks; the feeder sits on a box in the pen and holding the goose between his legs, puts the noodles into the mouth one at a time.

At first 3 to 5 noodles are fed three times daily, but the number is gradually increased until 6 or 7 are fed five times daily.

The noodles are made of scalded corn meal, ground oats, ground barley, and ground wheat or wheat flour, using about equal parts of each. Add salt as for bread, thoroughly mix the feed, and put it through a sausage stuffer, cutting the product into pieces $2\frac{1}{2}$ or 3 inches long. Boil them from 10 to 15 minutes, or until they float, in a wash boiler containing a wire rack which stands $1\frac{1}{2}$ inches above the bottom of the boiler. Dip the noodles in cold water and roll in flour to keep them from sticking together. Pour hot water over the noodles just before they are fed to make them slippery and keep them warm.










U.S. FARM SCHOOLS

1-NOON FARM FLASHES
 2-U.S. FARM SCHOOLS
 3-HOUSEKEEPERS' CHAT
 4-SPECIAL FEATURES
 5-ALL SERVICES

LEGEND:

- PACIFIC
- HAY AND PASTURES
- COTTON
- CORN, WHEAT AND MEAT
- DRY LAND RANGE AND IRRIGATION

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Poultry Short Course No. 2

POULTRY HOUSES

October 6-November 24
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*By M. A. JULL, Poultry Husbandman
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*By M. A. JULL, Poultry Husbandman
Bureau of Animal Industry*



This is the second group of printed lessons on poultry supplementing the U. S. Radio Farm School talks from broadcasting stations listed on inside of cover. All regularly enrolled students in the livestock, poultry, and dairy sections will be furnished the full series of booklets. These publications are mailed at the completion of each short course



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Contents

	Page
Lesson 1. Building a poultry house-----	1
Lesson 2. Important points in poultry-house construction-----	3
Lesson 3. Poultry yards and equipment-----	5
Lesson 4. Artificial lighting of laying houses-----	6
Lesson 5. Management of laying houses during winter months-----	9
Lesson 6. Cleaning and disinfecting the houses-----	11
Lesson 7. Houses for breeding stock-----	13
Lesson 8. Houses for turkeys, ducks, and geese-----	15

POULTRY HOUSES

Lesson 1. Building a Poultry House

The actual construction of a small poultry house is comparatively simple, and poultry keepers who are handy with the use of a hammer and saw can easily build one.

All of the material needed to complete the building should be on hand before construction work is begun to avoid delays.

It is necessary to have a working plan or rough sketch of the building showing the ground plan, the front elevation, and the end or a cross section of the house.

A bill of material can be worked up from the plan, and care should be taken to specify the lengths which will cut with the least waste. Plans of poultry houses can be obtained from your State agricultural college or from the United States Department of Agriculture.

Concrete Makes Best Foundation

First comes the foundation, which can be made of wooden posts or of concrete. All foundations should go down below the frost depth, and the floor level should be at least 4 to 6 inches above the ground level to obtain dryness.

In laying out the building the corners are squared by measuring a triangle whose sides are 6, 8, and 10 feet long, with a right angle opposite the 10-foot side. Levels in small buildings can be obtained by the use of a spirit level on a long, straight-edged piece of wood.

The studs should be made plumb and braced well until sheathed. Plates are spiked to the top of the studding and the rafters are notched to make a snug

fit and to provide good nailing space on the plates. A shed-roof building is the simplest and easiest type to construct and makes an excellent poultry house.

Walls are Usually of One Thickness

The walls of most poultry houses are built of siding or matched boards nailed directly on the framing timbers. Siding and sheathing should be laid so as to break joints in order to strengthen the walls.

Boards 10 to 12 inches in width, placed vertically, with the cracks covered with battens 2 to 3 inches wide, also make a cheap, tight wall. The doors of small poultry houses are usually made of the same material as the side walls, but mill-built doors are commonly purchased for larger houses.

Second-hand lumber, or lumber from large packing or piano boxes, may be used in building small houses, and old poultry houses or sheds may either be remodeled or they may be torn down and used to make a good poultry house.

Putting on the Roof

Prepared roofing laid over smooth sheathing is ordinarily used for covering the roof. Roofing will last longer on a roof with a decided slope than on one with but a slight slope. A good way to fasten the loose ends of roofing paper is to bend them under the sheathing, fastening the paper with a narrow wooden strip. The roof covering is the part of the building that wears out first and leaks should receive prompt attention.

Painting adds to the appearance and durability of buildings and outside appliances. All surfaces should be clean and dry before they are painted.

Buildings should be painted soon after they are constructed to preserve the wood and to prevent cracks from starting between the boards. A priming coat made of about two-thirds paint and one-third linseed oil should be used first, followed by one or more coats of paint, which should be thoroughly worked into the wood with the brush.

Lesson 2. Important Points in Poultry-House Construction

There are general principles which apply in all cases of poultry-house construction, but local conditions determine to a large extent the exact type which will give best results.

The first essential in housing is comfort for the birds; unless they have comfortable quarters they can not be expected to lay well. To be comfortable, a house must provide plenty of room for the birds, be well supplied with fresh air, and always be dry.

Dryness in a house depends upon the circulation of fresh air. While an abundant supply of fresh air at all times is essential, it is important that no drafts be allowed to sweep through the house.

A sure indication of an improperly ventilated poultry house is the condensation of moisture on the walls and ceilings.

Moisture Indicates Poor Ventilation

Moisture is given off by the fowls in breathing, and this foul air, which contains carbon dioxide as well as other injurious gases, falls to the floor. If these are not carried off regularly, the atmosphere of the house becomes excessively damp and during cold weather this dampness collects on the walls and ceilings in the form of rime.

The position of windows is very important, since they are used not only to admit an abundance of light but also to provide fresh air. Too much glass tends to make the house too warm in the daytime and too cold at night; for this reason it is most satisfactory to use cotton cloth in place of some of the glass.

The cloth sections should be kept open except during storms and very cold weather. During the warmer seasons of the year the windows should be left open as much as possible.

Give Particular Thought to Convenience

The second essential feature in housing is convenience. The house should be of such size and shape that work in it can be done with ease.

The fixtures in the house should provide for every convenience; windows and cotton curtains should be easily adjustable; hoppers should be of sufficient size to hold a quantity of grain; and nests should be easily accessible and removable.

The third essential feature in housing is economy. A new poultry house need not be expensive but it should be durable; the more durable the house the less the yearly cost of housing each bird.

The location of the poultry house has much influence on its success. It should be convenient for the attendant. It is desirable to have it in the shelter of large buildings or trees, which serve as protection against winds.

The soil of the poultry establishment should be naturally dry and well drained. In regard to the position of the house, it is best to have it face south or, in some sections, slightly southeast.

Of the various materials used in the construction of poultry houses, wood is of chief importance. The wood should be well seasoned, since green lumber is apt to warp, leaving cracks which permit drafts.

Yellow pine is used most in the construction of poultry houses. Concrete, since it is durable and sanitary, should be used for the foundation and floor. For roofing material, shingles or specially prepared roofing is used.

Determining the Size of the House

The size of a poultry house is determined by the number of birds to be housed, but it is not good commercial practice to keep too many birds in one flock, 100 being a good number.

A safe working rule is to allow about 4 square feet of floor space per bird. It is a good plan, however, to give the birds as much room as possible, keeping in mind the cost of construction per bird.

A long, narrow house is colder than a short deep one, because it is more inclined to be drafty. In a long house built to accommodate a large flock partitions should be placed about every 20 feet.

The house should be narrow enough to allow the sunlight to reach nearly all parts of the building,

but deep enough, at the same time, to give ample protection to the fowls. Fifteen feet should be about the minimum depth. Portable houses must be of such depth as to allow being moved.

The shape of the roof influences the cost of construction. The steeper the pitch the greater the cost. On the other hand, the steeper the pitch the longer the roof will last.

Most roofs are made about one-sixth pitch, but wood-shingle roofs should be one-fourth pitch. A gable roof will allow a false ceiling to be put in the house, which is an advantage in many sections of the country since straw can be packed in the gable and the house kept warmer and drier.

Lesson 3. Poultry Yards and Equipment

In conjunction with each house for laying stock there should be two large yards attached to it. The yards should be as large as possible and so arranged that the fowls can be kept in one for a considerable length of time while the other is being given a rest.

Small, bare yards are objectionable, because the birds do not get enough range or green feed and the soil soon becomes contaminated. Each yard should be plowed and cultivated occasionally and reseeded to a green crop of some kind.

In this way the possibility of having the flocks infested with worms and infected with various diseases is reduced considerably.

Roosts and droppings boards should be located at the rear of the house to give the fowls protection against drafts while roosting. The droppings boards should be about 2 feet above the floor, and the roosts should be 6 inches above the droppings boards.

Droppings boards should be made of tightly fitting matched lumber. Roosts should be made of 2 by 4-inch pieces, narrow side up, and the upper edges rounded off. Space the roosts approximately a foot apart.

Many poultrymen place wire netting immediately under the roosts so that the birds will be kept off

the droppings and thus can not pick at them and pick up worm eggs. Droppings boards should be cleaned every day, or at least every other day.

Locating the Nests

Nests are preferably located at the ends of the house and not under the droppings boards, thus leaving more floor space free for scratching.

It is highly advisable to have darkened nests built out from the wall so that the birds enter the nests from the rear, the front of the nests being made of a long door which can be opened for gathering the eggs. The advantage of using darkened nests is to prevent the egg-eating habit.

Mash hoppers and grit and shell hoppers should also be provided. Plans of hoppers can be obtained from the poultry department of most State agricultural colleges, or from the United States Department of Agriculture.

The drinking vessels for water and milk should be on platforms so that straw can not be scratched into them.

For plans of poultry houses and equipment suitable for your locality write to the poultry department of your State agricultural college. Your county agent or extension poultry specialist will be glad to give you information concerning the best location for the house and details of construction.

Lesson 4. Artificial Lighting of Laying Houses

The use of artificial lights in laying houses has been shown to produce results. Did you ever stop to think how little we ourselves would accomplish if we did not use electric or lamp light during the winter months?

Even our grandparents lengthened the day of work by using candles. The short days of winter, especially in the northern parts of the country, are too short to

allow the well-bred hen to obtain enough food to manufacture the maximum number of eggs she is capable of producing.

The use of artificial lights in the laying houses lengthens the short winter days and enables the hens to eat more feed and lay more eggs. A further interesting fact is that more eggs are obtained when the prices are highest. Also, after the pullets start to lay they can maintain their normal weights better when lights are used wisely.

Divide the Day into Equal Parts

Artificial lighting should never be overdone, because then the pullet is forced and often breaks down.

Approximately 12 hours of night and 12 hours day is a good working average for the layers during the winter months. But during the short days of winter it begins to get dark as early as 4.30 or 5 p. m., so the lights can be turned on at about the same hour in the morning.

Turning the lights on in the morning is the simplest way to lengthen the birds' day. This arrangement fits in better with farming operations than using lights both morning and evening or by turning the lights on during the night, say, between 9 and 10 o'clock, and giving the birds an evening meal.

The evening-meal method has given very good results, but it means that the poultry house must be visited practically every night to see that the birds get their feed and water.

Also when the night system is used and when the lights are used partly in the morning and partly in the evening it means that a special dimming system must be installed; that is, the light must be dimmed to require the birds to go to roost but still give them light enough to see the roosts.

The morning method, therefore, is the simplest and on the majority of farms would undoubtedly prove the most satisfactory.

Bring the Pullets to Lay Early

The use of lights for late-hatched pullets is especially worth while because they will come into laying when egg prices are high. If possible, separate the pullets into flocks according to their age and feed them according to their condition.

Experimental work has shown that a good lighting unit is a 40-watt lamp. It should be fitted with a reflector about 16 inches in diameter and the light should be suspended about 6 feet from the floor.

This height is necessary in order that the roosts shall be well lighted; otherwise some of the birds will not leave the roosts until daylight. Place the lights about 10 feet apart; if your poultry house is 20 feet long, two good lights should be sufficient.

The lights can be turned on by hand or automatically, for which purpose special clocks are made. Your local electrician should know how to install the lights and set the clock as well as to make sure that all connections and wiring are safe.

When to Begin Using Lights

The time of year when the lights should first be turned on in the mornings will depend, of course, upon the latitude and the age and condition of the birds. Ordinarily for most parts of the country the lights may be used after the middle of October.

When the lights are first turned on the poultrymen should be on hand to see that all birds leave the roost and to make sure that the lighting system is working properly.

The scratch grain can be scattered in the litter during the evening before and when the poultryman is satisfied that his system is working well; he can then leave the fowls to their own fancies, satisfied that the use of artificial lights will not only soon be paid for in increased egg production but that a good profit will be made.

The proper use of electric lights, making the hens' work day from 12 to 13 hours long, is a good investment.

Lesson 5. Management of Laying Houses During Winter Months

Wise management of laying houses during the winter months greatly increases the chances for good profits in egg production.

Egg prices are highest during the fall of the year because the hens have just gone through the molt or are still molting. Besides, the pullets are just commencing to lay and many of their eggs are still small and therefore command a lower price than if they were standard weight.

To produce a maximum number of eggs the birds must be kept as comfortable as possible.

First arises the question whether the birds should be confined within the houses during the winter months or be allowed access to the yard or range about the house.

Keep the Fowls Confined in Winter

During recent years it has been the custom of commercial poultrymen and many farmers to keep their birds confined during the winter months, especially when snow is on the ground and when frosts are heavy, even when snow is not on the ground.

Uninterrupted confinement requires, however, that the laying houses should never be overcrowded. It is advisable to keep the layers indoors from about November 1 to March 15 or April 1. The layers should not be turned out in the spring until the grass becomes well established.

Sanitation and the avoidance of drafts and dampness will do much toward maximum egg production. Birds will not lay well if the litter is allowed to become filthy, and, moreover, they may become infested with lice and affected with diseases.

The droppings board should be cleaned every other day at least, and the roosts should be disinfected occasionally to keep down mites.

Keep the Fowls Free of Lice

When the pullets are put in the houses they should be disinfected with sodium fluoride, rubbing pinches of it over different parts of the body. If this was not done then, it should be done now, because one good application of sodium fluoride to each bird will keep the flock comparatively free from lice for several months.

Clean chickens and clean houses will produce clean eggs and lots of them.

Renewing the litter in the house frequently will help to keep the house dry because the straw takes up the moisture given off by the birds. This is one way to help keep down dampness during cold winter days.

Another very effective method of keeping the house dry is to have a straw-filled gable with a ventilator in the roof. Straw in the gable takes up the moisture given off by the birds and the ventilator lets the foul air pass out and creates a circulation through the straw. It is this feature that has made the Missouri-type poultry house such a success throughout the Middle West.

Another effective way of helping to keep down excessive dampness is to keep the front of the house open as much as possible, especially during bright, sunny days. Not only should the windows be kept open, but the cotton curtains as well in order to provide the house with plenty of fresh air. Laying birds will stand a considerable degree of cold weather, provided the air is dry; but a damp atmosphere will soon cause a drop in egg production if the house is not well ventilated.

Proper Ventilation is Very Important

One of the easiest ways to obtain proper ventilation in a poultry house is to keep the front open as much as possible. It is advisable, of course, to close the cotton curtains on cold winter nights, especially if a storm is raging. Otherwise, give the birds an abundant supply of fresh air.

Another thing that hens do not relish and that very materially affects their health is drafts. Birds can not stand drafts, and if they are exposed to them very long they will catch colds, which may very quickly develop into roup—one of the worst diseases to combat if it gets well established.

A deep house has a great advantage over a shallow one. The birds while roosting are sufficiently far away from the front opening not to come in contact with any drafts but at the same time get plenty of fresh air and are kept in good health.

In the spring as soon as the grass is well established the birds should be let out alternately, if possible, into two poultry yards. Let the birds use one for a week or two or even a few months while the other is being well established with some green crop. Then change the yards about and cultivate them occasionally in order to keep down infection caused by diseases and parasitic worms.

By observing these few rules in connection with the management of poultry houses during the winter months the egg basket will be kept filled at just the time of year when a dozen of fresh eggs is worth the most.

Lesson 6. Cleaning and Disinfecting the Houses

The poultry house should always be kept clean and sanitary and should have plenty of sunlight. This will help materially in keeping the fowls healthy and free from disease and parasites. That germs cause contagious diseases and that parasites cause weakness and loss of flesh are facts the poultryman should keep in mind. Germs and parasites find ideal breeding conditions in a dirty poultry house. They can be destroyed, however, by good disinfectants properly applied.

The droppings boards should be cleaned at least twice a week and should be sprinkled with sand, dry dirt, or sawdust. The nests should be so constructed that it will be easy to clean them.

About 2 inches of clean straw should be kept in the bottom of the nests, which should be changed or renewed as often as it becomes soiled or used up. Dirty nests make dirty eggs, and bare nests often cause cracked eggs.

If dust boxes are used they should be emptied and filled with clean, fine dirt or ashes three or four times a year. The litter on the floor should be renewed as often as it becomes dirty, damp, or used up, and this condition will depend on weather conditions and on the number of fowls kept. Usually it should be taken out about every eight weeks and replaced with 4 inches of clean straw, shavings, sawdust, or sand.

Give a Thorough Cleaning Twice a Year

The entire house should be thoroughly cleaned and disinfected twice a year—in the fall before the pullets are put in the laying pens and again in the spring before the weather begins to get warm. It is very important that the house be cleaned thoroughly; scrape all surfaces where the manure and dirt have collected before using the disinfectants. Concrete and wooden floors are more sanitary and very much easier to keep clean than dirt floors. If dirt floors are used, the top 2 or 3 inches of soil should be removed each year and replaced with fresh sand or fine gravel and dirt.

All feed hoppers and drinking vessels should be cleaned and disinfected. The drinking vessels should be kept cleaned by washing and scrubbing them frequently during the year.

After the house is thoroughly cleaned, disinfectant should be carefully applied to the interior, worked into all cracks and crevices, and spread over the ceiling and the floor, the roosts, dropping boards, and the nests. Disinfectants are usually applied with a spray pump, or they may be applied with a brush.

Use a Disinfectant Freely

Any standard disinfectant may be used in the house. Ordinary whitewash made from freshly

slaked lime is satisfactory, but this can be improved as a disinfectant by adding 2 ounces of crude carbolic acid to each gallon of the whitewash. This material gives an attractive white appearance to the interior of the house.

One of the best disinfectants is a compound solution containing 50 per cent cresol, which can be purchased ready for use. Add 1 pint of the solution to 10 quarts of soft water. This may also be used as a spray to disinfect the ground. A 5 per cent solution of carbolic acid (1 pint of carbolic acid to 10 quarts of water) also makes a very good disinfectant. Sunlight is an excellent disinfectant and aids very materially in keeping the house dry and sanitary.

The roosts, droppings boards, and inside of the nests should be painted or sprayed with either crude petroleum or anthracene oil (carbolineum) twice a year for mite control. Automobile crank-case drainings also may be used for this purpose. If such a treatment is not given, the roosts and dropping boards should be sprayed with a standard disinfectant every 6 to 8 weeks during the winter and every 2 to 3 weeks during the summer. It is also very important that the ground around the poultry houses be kept clean and sanitary.

Lesson 7. Houses for Breeding Stock

Dryness, good ventilation, sunlight, space enough for comfort, and economy of labor are some of the essential things to be considered in houses for poultry-breeding stock. Conditions should be made as favorable as possible.

From 5 to 7 square feet of floor space should be provided for each fowl; they should be kept in small flocks, and plenty of roosting space and yard space provided.

Breeding fowls need all the sunshine they can get and plenty of exercise. They should be allowed out of doors during the winter months whenever the weather is fine, and openings should be made in the front

of the house so that the hens may get direct sunlight while inside.

The number and size of the openings must be adapted to climatic conditions. Breeding fowls must be kept from having their combs frosted or frozen, as this affects the fertility and hatchability of the eggs. To prevent this the house must be made comfortable and be kept free from moisture, which can be accomplished by proper ventilation.

Straw in the gable or top of the house helps to keep it drier and warmer during the winter and cooler during the summer months. The house can also be made cooler in the summer by having openings in the back part of the house, and all houses over 10 feet deep should have a window in the rear wall just above the floor for light and ventilation.

Movable Houses are Best for Breeding Flocks

Breeding houses should be deep enough to keep the hens comfortable during cold weather. The depth will depend on the size of the flock, but usually it is from 10 to 15 feet. Many breeding houses are built on runners so that they can be moved every year or so to fresh ground. Such houses must be comparatively small, as it is difficult to move a house larger than 10 by 14 feet. The house should face the south and should be located where there is good drainage of water and air so that the floor and yards will be dry; the location should also provide for protection from winter winds either by other buildings or by natural windbreaks.

Breeding stock should have as much range as possible, and usually it is most convenient to keep the birds in small or colony houses. Free range is desirable, but is not practical where the breeding stock consists of several matings which must be kept in separate pens.

Colony houses on open range should be placed from 100 to 200 feet apart, depending on the number of fowls kept in each house. Where the fowls are yarded, from 200 to 250 square feet of yard space

should be allowed for each fowl in order that a good grass sward can be maintained in the yards. Less space per fowl is needed for small fowls, or for large flocks, than is required for large fowls, or for small flocks.

The interior fixtures of the house should be simple, inexpensive, and easy to clean. They consist of roosts, droppings boards, nests, and feed hoppers. The roosts should be next to the rear wall where they are out of the way and where the hens are kept out of drafts. Trap nests are often used; this is a laying nest so arranged that the hen can not get out until released by an attendant. They are essential in any careful breeding work.

Lesson 8. Houses for Turkeys, Ducks, and Geese

Shelter in the nature of well-built houses is not so essential for turkeys as for chickens. During the warmer seasons of the year turkeys roost out of doors, but it is advisable to provide an open shed, with one high roost, where they can find shelter during stormy weather.

Mature turkeys, however, need housing only in the colder sections of the country, where covered open-front sheds should be provided.

No interior equipment is necessary, since turkeys usually make their nests out of doors. Turkeys should never be exposed to dampness, but they can stand a reasonable degree of dry cold.

The breeding flock is usually allowed free range throughout the year, and if the flock is large about 1 acre as a breeding yard or pen should be allowed for every 15 turkeys.

Poults Must be Kept Warm and Dry

Well-built coops are necessary for brooding and rearing the young turkeys, commonly called poults, and protection from rains and dampness is absolutely essential, as the greatest loss in turkey raising occurs in the first five weeks after the poults are hatched.

The brood coops may be any shape, but should be of ample proportions and well ventilated. Separate coops should be provided for each brood, and they should be placed some distance apart.

In housing ducks, where only a few are kept on general farms as a side issue, the ordinary henhouses are used, and these should have plenty of sunlight and good ventilation; they should be easy to clean and should be kept dry.

A good house which will accommodate 200 breeders can be made 20 feet deep by 40 feet long, 7 feet high in front and 4 feet in the rear, with a shed roof.

From 4 to 5 square feet of floor space should always be allowed for each breeding duck. About one-fourth of the front of the house should be made of glass windows and one-fourth of muslin curtains. A glass window on the east and one on the west end will allow additional ventilation and will help to dry out the house.

Ducks keep the floor damp, so that plenty of litter should be provided, which should be changed frequently, and all of the windows kept wide open during the day except in stormy and cold weather.

Ducks lay their eggs on the floor of the houses, and the nests should be built like stalls, 12 inches wide, 18 inches deep, with a partition 12 inches high, and a 5-inch strip in the front part of the nests.

A Good Equipment of Duck Houses

Three types of houses are used on large duck farms: Open breeding houses, such as described above; open fattening houses or pens where the young ducks are kept while being prepared for market; and brooder houses for ducklings, of which there are usually three kept for the winter brooding of ducks, the ducklings being moved to each of the houses in turn as they are hatched.

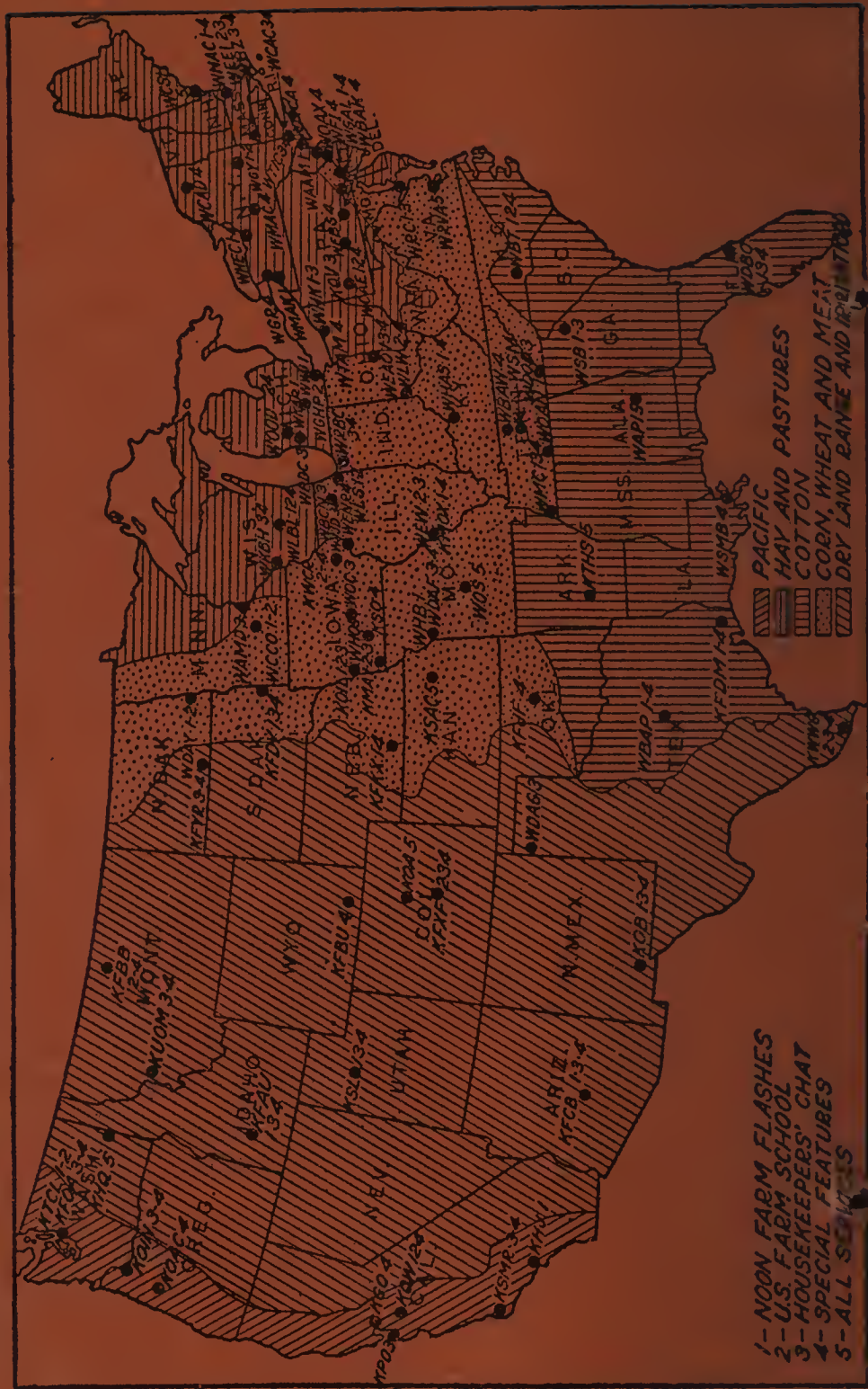
The housing of geese is similar to the housing of turkeys. Mature geese need a house only in cold or stormy weather. An open shed, a poultry house, or

a barn is usually provided for geese in the North, and such shelter is used in the South to some extent. Good-sized brood coops should be provided to keep the young geese dry during the rearing season. The coops should be kept clean, with plenty of clean straw or shavings on the floor of the house during the winter.





Broadcasting Stations Cooperating with the U. S. Department of Agriculture



U.S. RADIO FARM SCHOOL

U.S. DEPARTMENT OF
AGRICULTURE

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Poultry Short Course No. 3

MANAGEMENT OF POULTRY BREEDING STOCK

December 1, 1926, to
January 19, 1927



*By M. A. JULL, Poultry Husbandman
Bureau of Animal Industry*



Radio Stations Broadcasting the United States Farm School

Scheduled on Monday, Wednesday, and Friday, unless otherwise specified)

WGY-----	{ 6.20 p. m., Monday and Friday. 6.45 p. m., Wednesday.
WLS-----	6.15 p. m.
WCCO-----	7.30 p. m.
WOS-----	7 p. m.
KFKX-----	7.15 p. m.
WLW-----	1.40 p. m.
WHO-----	2.15 p. m.
KFXF-----	7.15 p. m.
KHQ-----	5.30 p. m.
KMA-----	11 a. m.
KOIL-----	7 p. m., Monday, Tuesday, and Friday.
KQW-----	6.35 p. m.
KTCL-----	8 p. m., Monday, Thursday, and Friday.
KTHS-----	12 m.
KVOO-----	11.30 a. m.
KWCR-----	8.55 p. m.
WCAE-----	7.10 p. m.
WCSH-----	7.30 p. m.
WEW-----	5 p. m.
WGHP-----	6.40 p. m.
WLBL-----	12.30 p. m., Monday and Wednesday.
WOOD-----	7.35 p. m.
KFBB-----	1.30 p. m.
WMAK-----	6.40 p. m., Wednesday.
WHAM-----	6.45 p. m., Wednesday.
WFBL-----	6.45 p. m., Wednesday.

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Contents

	Page.
Lesson No. 1. Selecting the breeders-----	1
Lesson No. 2. Importance of constitutional vigor-----	4
Lesson No. 3. Relative importance of the male-----	7
Lesson No. 4. Size of matings-----	12
Lesson No. 5. Feeding poultry breeding stock-----	15
Lesson No. 6. Vitamins and minerals-----	18
Lesson No. 7. Getting good fertility-----	21
Lesson No. 8. Getting good hatchability-----	25

II

MANAGEMENT OF POULTRY BREEDING STOCK

Lesson No. 1. Selecting the Breeders

The highest producing hens will be found hard at work at the end of the laying year, in September and October. A good time to select breeding hens is during these months.

Hens laying at this season can easily be distinguished from the nonlayers because their plumage will be old, soiled, and ragged, with tail feathers broken off by constant visits to the nest. The drain of laying has caused the yellow pigment to be withdrawn from the body, and the beak and shanks will be found white in color.

The poor layers, on the other hand, molt early, and their plumage in late August and September is likely to be clean and new. They will also have yellow beaks and shanks.

The late molters should be saved for breeders and the early molters should be culled at once.

Constitutional Vigor Essential

The first consideration in the selection of breeders is constitutional vigor which is indicated by their physical condition at the end of a year of persistent laying when they should be strong, active, and in fairly good flesh.

Hens of this kind are usually of medium size and of the busy, active, self-reliant type. Good shoulder girth is a necessity for proper heart and lung development and there must be ample abdominal capacity for digestion and assimilation.

Closer examination will show a broad, deep head, short, well-curved beak, and full, bright, prominent eyes set wide apart. The neck is moderately short, strongly arched, and blends well at base of hackle into broad shoulders. The full, deep body should be well balanced in front and rear so that the back is carried nearly level. The sturdy legs of medium length should be set wide apart squarely under the center of the body so that the bird can easily support the body weight and move about with freedom. The size of the hens should be approximately the standard weight of the breed they represent.

An indication of vigor may be seen in length of life. Hens that continue to survive several seasons of rigid culling are extremely valuable. The fact that there is always a large number of short-lived individuals in a flock of pullets and yearlings, and also that production decreases with age, makes it necessary to replace each year worn-out hens with pullets. As this is an additional cost, the advantage of using "long-distance" layers as breeders to develop this character in the flock is evident.

Eggs for Hatching

Hens selected for persistence in production should be allowed a good rest before the breeding season begins. To check late production the mash may be taken away and a ration of scratch and green feed substituted.

Probably this should be done not later than November 1, and the hens allowed the freedom of a green range. Rape, winter rye, or wheat makes excellent pasture. This method of management will soon cause the reappearance of yellow color in the bleached-out beak and shanks and may be continued until two or three weeks before it is desired to save eggs for hatching, when the feeding of a palatable mash can be resumed.

Hens for Breeding

Consideration must be given to breed type and color or the flock will soon lose its uniformity of

appearance. Standard requirements can be combined with good egg production in the same individual and the combination, while difficult to attain, should be profitable in increased prices obtained for hatching eggs and breeding stock. The careful breeder will discard all hens with obvious standard defects if he wishes to improve the appearance of his stock as well as preserve its vigor. While certain standard defects in plumage color or shape of comb are not detrimental to production, other defects, such as slipped wings, crooked breastbone, and twisted tail feathers, are usually associated with low vitality and a weak constitution. Stubs, side sprigs, brassiness, and squirrel tails mar the uniform appearance of a commercial flock, but these standard disqualifications can be eliminated by careful selection and breeding.

Choosing the Male

Choosing the breeding male is even more important than choosing the breeding hens, as his influence on the character of the pullet flock will be greater. As in the female, the first requisite of the male is vigor.

Other characteristics particularly desirable in the male are a prominent breast, broad shoulders, a body deep in front, and a wide, flat back carrying its full width out to the base of the tail. The male is lacking in depth of abdomen as the keel bone turns upward in the rear, and is comparatively narrow between the pubic bones. These abdominal differences tend to give the contour of the male a rather tapering effect from the broad shoulders and full breast to the rear of the body. The male should be of good size and fully up to the standard weight for the breed. The extremely early maturing cockerels should not be used, as they are unsatisfactory breeders. The large-framed cockerel that has grown quickly and feathered well is a more desirable type. In the strong, bony framework of the best birds of this type are usually found a large gizzard, stomach, and intestinal tract. If thinness of body skin be added to this equipment the essentials are present for highest efficiency.

Lesson No. 2. Importance of Constitutional Vigor

Of paramount importance to the successful poultryman are health and vigor in the stock. For these qualities there can be no substitute. Without them good housing, feeding, and management are productive, at best, of only mediocre results. On the character and breeding of the birds the opportunities for profit are based, but there is little likelihood of realization unless health and vigor are outstanding attributes.

What is vigor? This term may be difficult to define, but as commonly understood we say a hen has health and vigor, if her eggs are fertile, if they hatch well, if her chicks live and are easily reared. The results of vigor are also seen in a hen that has laid persistently for 12 months and finishes up in good physical condition with no signs of weakness or exhaustion.

Longevity is also an indication of vigor. It is certain that success with either exhibition or utility stock depends primarily upon robustness and stamina so that eggs may hatch and chicks make quick, thrifty growth. Selection for vigor, then, is the foundation on which we must build if the poultry-raising establishment is to be a permanent one. The breeder must not be blinded by excellence of color to the necessity for vigor, strength, and constitution.

Evidence of Vigor

The fruits of health and vigor are seen in economical growth and reproduction, but signs of vigor are evident also in the appearance and behavior of the fowls. Bright, red color of comb and wattles with full, prominent, expressive eye, broad skull, clean, lustrous plumage, good substance in bone, strong feet, and legs set wide apart under the center of a deep, wide body—all of these show health and vigor.

Of course, the heavy-laying late molter has soiled and ragged plumage at the end of the laying year, but there is a marked difference in the close-fitting plumage of the high producer and the character of the rough, loose feathering of the loafer.

Alertness, absence of fear, and constant activity in the laying hen indicate a good nervous organization. She is also a good forager, first to leave the roost in the morning and last to return at night.

Lack of vigor is seen in slow, uneven growth, late maturity, long, slim, crow head, poorly developed comb and wattles, improper carriage of body, low egg production, low fertility and hatchability, high mortality in growing chicks and adult stock.

The selection of the male is even more important than the females, as half the heritage of all the pullets is received from the sire and his vigor must be unquestioned.

Inbreeding

Inbreeding without careful selection often causes loss in vigor. This is a common effect of close inbreeding and usually makes its appearance after a few closely related matings have been made. On the other hand, when selection is based on sound principles, desirable characters can be fixed in families and their good qualities intensified.

An advantage is gained in securing inbred males which can be used to stamp the desirable qualities of their ancestry on unrelated stock. Undoubtedly some of the leading poultry breeders have brought their strains to a high standard of excellence in type and color by judicious selection and line breeding.

Most of the experiment work in inbreeding poultry, however, has shown rather marked deterioration in fertility, hatchability, and egg production, particularly when selection was not carefully practiced. When there is difficulty in hatching the eggs and growing the chicks from inbred stock the breeder must cross his inbred families or use inbred males with unrelated hens.

Feeding and Management

Besides selection of healthy, vigorous individuals and careful breeding, every detail of feeding and management that will tend to increase vigor in the stock

should be thoughtfully studied and immediately put into practice. Losses from various inadvertencies or bad management will soon leave their effects on growth or production and cut profits to an exceedingly narrow margin.

Crowding of large numbers of chicks into small hovers is bad business, and results in heavy losses in chicks, poor growth, and pullets that lack uniformity. Many of these will not lay until late in the winter.

By raising smaller numbers and providing adequate space in houses and on range, there will be less loss in chicks, thriftier growth, and a much larger percentage of earlier maturing pullets. These should not be brought into production until fully developed and an excess of body weight added by feeding plenty of scratch grains. Thus a reserve of fat and energy is provided on which the pullet may draw during the strenuous season of heavy production.

In the Laying House

In the laying house the comfort and well-being of the laying pullets must be carefully safeguarded so that health and efficiency may be unimpaired. There should be proper ventilation, insuring freedom from dust, coupled with protection from drafts and the maintenance of as uniform a temperature as possible. Laying pullets should not be allowed out on snow or frozen ground.

If the laying house is artificially lighted, the birds should not be given a working day of more than 12 hours. A stimulating mash can be fed to the layers, but care must be taken to feed adequate quantities of scratch grain, so that body weight is kept up. If the pullets are pushed to an abnormally high rate of production by forcing methods, they lose flesh too rapidly, slump in production, and the door to premature molt and incipient disease is open. A steady 50 per cent production—meaning 50 eggs a day from 100 birds—with the flock maintaining full health and vigor, will be found less risky and more profitable.

The Breeding Stock

The breeding stock needs equally discriminating care. Here the aim is to obtain fertile, hatchable eggs and chicks that will live and grow. The conservation and promotion of health and vigor are the first essentials and winter egg production must not be expected from the breeders.

Removal of the laying mash on November 1 will check egg production, and scratch feed with a small amount of milk should bring the breeders through the molt in good shape. A two-months' vacation is none too long, and this period should find them at liberty on green range, if possible.

These measures will bring back the flesh and energy lost during production, renew the yellow pigment in skin, beak, and shanks, build up body fitness, and restore health and vigor in full measure.

If the poultryman will study the effect of vigor on performance, behavior, and appearance; if his matings are planned to promote constitution and efficiency; if every detail of feeding and management paves the way to better health; in short, if the vigor of the flock is placed above all other considerations, the poultryman will have gone a long way in the solution of his problems.

Lesson No. 3. Relative Importance of the Male

While in general there is equal inheritance from the sexes, the individuality of the male is much more important than that of the females to which he is mated, because half of the heritage of all the pullets is received from the sire. There is food for thought in the old saying, "A good male is half the flock; a poor one is more than half."

Color Uniformity

A common illustration of the practical value of males can be seen in the grading up of mongrel flocks by use of purebred males. For example, the advantage in using Single-Comb White Leghorn males or

Barred Rock males on the average farm flock of miscellaneous color and breeding is in securing in the first generation flocks that are, respectively, of white or barred color.

This uniformity of color in the first generation is due to the dominance of the white and barred colors. It would take probably three or four generations to establish white color in the flock if White Rock or White Wyandotte males were used, as this white color is recessive.

Excellent results in improving the size and color of a mongrel flock were shown in grading up work at the United States Experiment Farm by the use of purebred Barred Rock and White Rock males. Gains of 1½ to 2 pounds per bird were secured in two generations of breeding.

The sharpness of color pattern, the narrow barring, and good, bluish tone of color seen in fourth and fifth generations of the Barred Rock cross made it impossible to distinguish these grade pullets from purebred stock. White color was not well established in the White Rock grades until the third generation. Egg production in the White Rock grades was quite satisfactory, several individuals in the fourth and fifth generations laying 250 eggs or better.

The Use of Egg-Bred Males

Splendid results have been secured in farm flocks and on commercial poultry farms by the introduction of egg-bred males of superior production quality. The Pacific coast breeders have done outstanding work in developing high production in their flocks.

Undoubtedly the use of these males in many commercial flocks has raised the average production from 15 to 50 eggs per bird. As far back as 1912 the Kansas Agricultural College showed what might be done in increasing egg production by using egg-bred males on mongrel stock. The average egg production for these mongrels was 98 eggs, but three generations of breeding raised it to 156 eggs per bird. In this last generation of pullets production records of 248, 250, and 260 eggs were made within a year.

The continued use of purebred males on a farm flock will result in a comparatively short time in producing fowls which are practically purebred, and a desired uniformity in stock and eggs may be obtained in this way. Grading up, however, is not a practice to be recommended in preference to the purchase of purebred stock. If it is at all possible to make the necessary initial investment for purebred stock at the start it is much better to do so.

Prepotency

Prepotency is the ability of a male or female to stamp its characteristics on its progeny. The power of certain individual males to transmit their own excellence in color, type, or egg production makes the possession and use of such a bird important in developing superior qualities. In the development of our present-day popular breeds of poultry, outstanding sires have played an important part in establishing uniformity of color and type.

A male is said to be prepotent with regard to the transmission of egg production when his progeny make high production records regardless of the breeding of their dams. While it would be most desirable to mate a prepotent male with hens of superior breeding and egg ancestry, a really prepotent sire will stamp the desirable qualities of his own ancestry on his offspring even when mated to very ordinary females.

It is sometimes thought that strong masculinity is an indication of prepotency, but though vigor is a most desirable attribute in itself and of the utmost importance in all breeding, there is little evidence that vigor indicates prepotency in special characteristics. When this quality of prepotency is manifested in a desirable way the progressive breeder will take full advantage of it. Prepotent males should be used as long as they live.

Line Breeding

Line breeding, or the mating of related individuals, is an excellent way to obtain uniformity of the off-

spring, increasing the percentage of birds with desirable breed characteristics or egg production. By bringing together birds of more nearly uniform character in hereditary material the probability is increased that the progeny will resemble the parents, unless undesirable factors are concealed in the heredity. The mating of related animals carrying defects will serve to bring out and perpetuate them.

A tendency to similar weaknesses or diseases makes it impossible to inbreed certain families for any length of time. Other sturdy stocks do not seem to suffer a great deal from continued close breeding. Inbreeding unquestionably results in rapid fixation of type and enables the skillful breeder to obtain results much more quickly than without its use. If the inbred male is a good representative of the breed, he should be quite satisfactory in stamping the desirable qualities of his ancestry on unrelated stock on account of the uniformity of the hereditary material in his ancestry.

Standardbred Males

Values of standardbred males are based on individual merit, breeding, or pedigree, and the record of the bird as a breeder. Most buyers insist on a vigorous appearance and good looks, with the idea that the bird himself should be a demonstration of the value of good breeding. Other purchasers will buy males out of good families even if the birds are not outstanding individuals, relying on the quality in the blood lines and the reputation of an established breeder.

Males of good breeding will undoubtedly improve the quality of a flock even if possessed of certain minor defects, such as a small amount of coarseness or irregularities in head points. Very few male birds are purchased on performance as breeders, as these individuals are usually considered too valuable to be sold. Sometimes good breeding birds have defects in color which prevent showing them, but if they have good blood lines and strong vitality they may be invaluable in the breeding pens.

In most cases a good-looking bird is apt to be well bred, but there are some cases where an extraordinarily well-colored bird is the result of a chance combination of factors in an excess color mating. Birds of this kind can not be used to advantage as breeders, however, unless their breeding is known. Male birds from an old and established strain, even though not particularly impressive as individuals, will often give surprisingly good results as breeders because their inbred ancestry is rich in desirable qualities.

Sometimes minor defects that prevent breeders from showing certain males or females are a blessing in disguise, as many finished cockerels of great promise are overshadowed during the winter and brought back to the breeding yards with depleted vitality to be mated with too many females. These cockerels often fail to develop into useful cocks, and in many instances are unsatisfactory breeders.

Selection of the Male

Selection of the breeding male should be designed to correct faults in the females, and he should be a much better individual than any of the females. If the females are too rangy a compact, blocky, well-balanced male bird should be used with them. If the females are not of good type and color, the male should be sound in both respects. As in the female, the first requisite of the male is outstanding and unquestionable vigor.

Other characteristics particularly desirable in the male are prominent breast, broad shoulders, depth of body in front, and a wide, flat back carrying its full width out to the base of the tail. Unlike the hen, the male is lacking in depth of abdomen, as the keel bone turns upwards in the rear. There is also comparative narrowness between the pelvic bones of the male. These abdominal differences tend to give the contour of the male a rather tapering effect from the broad shoulders and full breast to the rear of the body.

The male should be of good size and fully up to standard weight for the breed. Extremely early maturing cockerels should not be used, as these pre-

cocious or "pony" males are not satisfactory breeders. Hatching eggs from matings headed by males of this type may show a high degree of fertility, as the "pony" male is of an active, nervous type. But he is also liable to be rather undersized, overrefined, and generally lacking in ruggedness of constitution.

The large-framed cockerel that has grown quickly and feathered well is a more desirable type. The only absolute way to know the prepotency of a male or his ability to transmit character is by the progeny test. The trap nest will actually determine the number of eggs laid by his daughters and their performance in turn measures the breeding value of the male. As there is a high correlation between winter egg production and annual egg production, the sire of pullets which have made good winter records can be used again the following year. This is a decided advantage, as prepotent males are extremely valuable and their usefulness as breeders is limited to a comparatively short period.

Unless cockerels are well fed, full development does not take place and intelligent selection is not possible. Male birds which have never had a chance to develop properly or those from stock which has never had an opportunity to demonstrate its capacity for egg and meat production are not promising material for the selection of breeding stock.

Lesson No. 4. Size of Matings

The size of mating depends on the breed, the conditions under which the birds are kept, and individual vigor. As a rule, however, a male of the Leghorn class will usually give good results with about 15 females. A male of the general-purpose breeds, such as the Plymouth Rock or Rhode Island Red, with 10 or 12 females; and a male of the Asiatic breeds, such as the Brahma or Cochin, with 8 or 10 females. If the male is especially strong, vigorous, and active, however, and the fowls are running on free range, the number of hens used with the male can often be materially increased. Plymouth Rock males on farm range have been known to give good fertility with

20 or 25 females, and Leghorns under range conditions have often given excellent fertility with 30 or 40 females.

Stud Mating

If it is desired to breed females to 2 or 3 males during the season and separate pens are not available for this purpose, stud mating may be used. By stud mating is understood the practice of keeping the males in separate quarters and bringing to them the females with which they are to be mated.

Trap nesting is usually done when stud mating is practiced. The hens can be mated after laying each second or third egg, and the fertility from matings of this kind should be as good as if the male were running with the hens. Usually the hen is left with the male for one-half hour at this time.

While stud mating requires more work than ordinary mating it has some advantage in allowing certain females to be mated with different males during the same breeding season, while the hens can remain together and be cared for as usual. It also assures better fertility than would be the case if a male were mated to too many hens in a large flock.

When flocks are too large to give good fertility with one male, two or more males are often used. They can be allowed to run with the flock at the same time, but very often there is a tendency for the strongest male to dominate the flock and to do nearly all the breeding.

Good Plan to Alternate the Males

Better results are probably obtained when the males are alternated. One of the males can be used to run with the flock in the morning and the other in the afternoon, or they can be changed on consecutive days. The disadvantage in this type of mating is in the lack of knowledge as to which male has sired the offspring.

A description showing the purpose of each mating and the individuals used in the matings should be

carefully made and filed for reference. Later these descriptions may be very valuable, as they will enable the breeder to remember the exact number and character of individuals which have proved to be good breeding birds, and yield valuable knowledge which might otherwise have been overlooked.

Mass Mating

On commercial poultry farms and in large farm flocks mass matings are made. When several males are used on a flock of breeding hens in this way it is impossible to tell the breeding of the progeny, but on many farms little breeding is done and the desire is merely to obtain hatchable eggs. Usually the fertility and hatchability from matings of this kind are very good and in some cases higher than in single matings.

There is a tendency in mass matings, however, to use too many males. For example, in a flock of 100 Leghorn breeders as many as 8 to 10 males are often seen. It is believed this is entirely too many, as when the number of males is excessive a good deal of their time is usually wasted in driving each other about and interfering with each other in mating.

Probably there would be much greater efficiency in a flock of 100 Leghorn breeders if only 4 males were used. It is believed that 6 males are enough for 100 females of the general-purpose breeds.

Period of Fertility Varies

Extremely valuable or prepotent males should be bred as long as they live. Often in such cases the fertility will decline after the male bird's age increases. If this occurs, the number of females can be reduced to those of the very best quality. Leghorn males will often continue to fertilize until 4 or 5 years of age, and in some cases longer than this, but many males of the general-purpose breeds are not dependable after the second year. On the other hand, individual Rock and Red males have been known to give excellent results in fertility and hatchability up to 5 or 6 years of age.

Lesson No. 5. Feeding Poultry Breeding Stock

Breeding fowls need special attention in feeding and management so that they may be kept in the best of condition to produce fertile eggs containing strong germs. Pullets do not make as good breeders as older birds, therefore yearlings or older hens should be used for breeding if possible. They must be carefully selected and mated, as well as properly housed.

There is no one best ration for all conditions, but many of the grains can be fed interchangeably, depending on their availability and price. The additional cost of a good ration is repaid many times by the number and kind of eggs obtained.

The Breeding Ration

The breeding ration should not only furnish the necessary amount of nutrient, protein, carbohydrates, and fat, but should also furnish minerals, vitamins, and green feed.

Greater bulk and better palatability, with less corn meal and meat scraps, are more essential in a breeding ration than in a ration fed primarily for egg production. The corn meal in the ration should be ground yellow corn, if possible, as that is much higher in vitamin than most commercial corn meal or than corn meal made from white corn. Ground wheat is very desirable for breeding fowls, and may well replace all the middlings and half of the wheat bran in the ration, wherever it can be readily obtained.

Good breeding rations may be made of the following scratch mixtures and mashes.

MASH

Parts	Or—	Parts
Yellow-corn meal-----	Yellow-corn meal-----	35
Wheat middlings-----	Oat meal-----	14
Meat scrap or fish meal-----	Middlings-----	12
Finely ground oats---	Bran-----	10
Wheat bran-----	Meat scrap-----	7
Old-process linseed meal-----	Fish scrap-----	7
Bone meal-----	Alfalfa leaf meal-----	5
Salt-----	Dried buttermilk-----	3
	Bone meal-----	4
	Ground limestone-----	2
	Salt-----	1
100		100

SCRATCH MIXTURE

	Parts	Or—	Parts
Cracked corn-----	40	Corn-----	50
Wheat-----	40	Wheat-----	25
Heavy oats-----	20	Heavy oats-----	25
	<hr/> 100		<hr/> 100

Where commercial mixed poultry feeds are used, no change is usually made in the ration when it is used for the breeding stock.

Milk a Good Supplement

Milk is one of the best supplements for rations for breeding fowls, and should be used if obtainable at a reasonable cost. It is valuable for its proteins, minerals, and vitamins.

If only a small quantity of milk is used, no change should be made in the mash, but if much milk is fed the meat or fish scrap should be reduced accordingly. Milk also helps to take the place of green feed.

Green Feed Necessary

Green feed in abundance is necessary for breeders. Where green feed and outdoor range are not available, an outdoor free range which will provide ample green forage assists materially in the production of hatchable eggs and helps to keep up the vitality of the stock.

The sunlight on an open range is very beneficial, and all breeding fowls should be given as much direct sunlight as possible. The sunlight which comes through glass is not sufficient.

Cabbage, Swiss chard, and sprouted or germinated oats are good green feeds for winter use when there is no green feed on the range. Alfalfa and clover hay, made from the second or third cutting, are also good. Alfalfa leaf meal is not so good as the hay, but can be used if no other green feed is obtainable. Cod-liver oil has proved to be a fairly effective substitute if used at the rate of 1 pound to 100 pounds of mash.

Where small yards are used they should be divided into two parts and used alternately, planting the vacant sections two or three times yearly to a quick-growing grain crop, such as rye, wheat, oats, barley, or rape. The land must be kept sweet and fresh. Crushed oyster shells, clam shells, or limestone grit should be kept before the hens all the time. It is very important that the hens have plenty of lime in their ration to make good eggshells. A constant supply of clean drinking water should always be available. If the drinking water freezes in the winter, fresh water should be supplied.

How to Feed

The scratch mixture should be fed twice daily, preferably in litter from three to five inches deep on the floor of the henhouse. About one-fourth of this mixture should be fed in the morning and the remainder in the afternoon.

The mash is usually fed dry and kept before the hens all the time. Plenty of hopper space should be provided for the hens. A moist mash is suitable for use with table scraps.

The aim in feeding breeding fowls is to keep them in good condition but not allow them to get fat. They should be kept hungry and active during the day, but given full feed of scratch mixture in the afternoon. The scratch feed should be regulated so that the hens will consume approximately equal parts of mash and of scratch feed during the normal breeding season.

The amount of grain to give breeding hens varies with their egg production, with the size of the hens, and with the time of the year. A general estimate is to feed about 8½ pounds each of scratch grains and of mash daily to 100 Leghorns and about 10½ pounds of each to 100 general-purpose fowls.

The mash may be removed from breeding fowls for a month or six weeks in the early winter (November 1 to December 15), so that all the hens will stop laying and molt. Instead of removing the mash entirely the meat scrap may be omitted. It is important to have the hens all through molting before

severe winter weather comes. The eggs laid by hens just after they have molted usually make especially good eggs for hatching.

Lesson No. 6. Vitamins and Minerals

Vitamins and minerals are essential in the rations for poultry of all ages. These two accessory food elements are very closely related to each other in their influence on growth. A deficiency in vitamins in rations prevents utilization of certain essential minerals even if present in abundance. The nature of the vitamins is not clearly understood, but their effect is very apparent. They contribute neither energy nor tissue-building material, but tend to regulate and control certain vital processes in the animal organism.

The Five Vitamins

Five vitamins have been discovered so far, of which all except one, known as vitamin C, are essential in poultry rations. The four essential vitamins are (1) vitamin A; (2) vitamin B; (3) vitamin D, which prevents rickets; and (4) vitamin E, the absence of which in the diet causes sterility.

Lack of vitamin A in the diet causes poultry to stop growing and lose weight. It also lowers their vitality and makes them less able to resist disease. Young and growing chickens require more of this vitamin than mature fowls. Vitamin A is associated with many of the fats. All green feeds, cod-liver oil, yellow corn, egg yolk, tomatoes, yellow carrots, and milk are the principal sources of vitamin A, though it is unstable and is readily lost.

Vitamin B is the most widely distributed of all the vitamins and is usually well supplied in ordinary poultry rations made up of cereals and their by-products. Corn, wheat, oats, middlings, and bran contain considerable quantities of this vitamin, and it is abundant in all green feed and in yeast.

Lack of vitamin D in the ration causes leg weakness or rickets in brooder chicks. This vitamin controls

the utilization of the minerals. It is most abundant in cod-liver oil and egg yolk, but some of the green feeds and milk also contain small quantities of this vitamin. It differs from vitamin A by being very stable and is not likely to be destroyed.

Not so much is known about vitamin E, which affects sterility, but the richest source yet found is wheat germ. It is found in small quantities in some green feeds, in germinated oats, in yellow corn, and in cottonseed and olive oils. Milk contains it in very small quantities, but cod-liver oil is notably lacking in this vitamin.

The usual poultry rations, if supplied with green feed and moderately high in yellow corn and wheat middlings, are usually fairly well supplied in essential vitamins, especially if the ration includes some milk. As green feeds contain practically all the vitamins, their great value in a poultry ration is very apparent. Fortunately poultry rations contain a large amount of grain by-product, such as middlings and bran, which contain considerable vitamins and are also high in minerals.

Vitamins for poultry feeding should usually be supplied in the natural feeds and not bought from the drug store.

The various methods used in handling milk commercially, such as drying or condensing, do not appear to affect materially the vitamins necessary for poultry feeding.

Direct Sunlight Desirable

Direct sunlight is effective in curing leg weakness and is a substitute for vitamin D. This shows the great importance of direct sunlight for poultry of all ages.

The ultra-violet rays in sunlight produce this effect, but these rays will not pass through ordinary window glass. The glass substitutes used in poultry buildings allow some of the ultra-violet rays to pass through, provided this material is kept free from dust. The results obtained, however, do not compare favorably with direct sunlight.

The Use of Cod-liver Oil

Cod-liver oil, which is rich in both vitamins A and D, is a desirable addition to the ration for chicks while they are confined to the brooder house or are receiving very little direct sunlight. The use of this oil tends to prevent leg weakness in growing chicks. It may be fed throughout the growing period, but is not essential after the chicks are out of doors on a good grass range.

The value of cod-liver oil for hens has not been conclusively demonstrated, but it seems desirable to add it to the ration when hens are kept confined to the poultry house, and it may also be economical to feed it to breeding fowls during the winter and early spring months.

One quart of the oil should be added to 100 pounds of mash for either chicks or hens. Not over two weeks' supply of feed should be mixed with this oil. The oil should be mixed with a small quantity of the feed and then incorporated into the entire mixture. It should be omitted from the ration for growing chicks two weeks before they are marketed, as it may affect the flavor of the poultry flesh.

Minerals

Minerals are very essential in poultry nutrition but are less apt to be deficient in the ordinary rations than are the vitamins. The mineral salts, in addition to building up bone structure, play an important part in connection with the digestive acids and changes in nutrients.

Common salt supplies sodium and chlorine, two essentials in animal life. Lime and phosphorus compounds are the most important minerals. Oyster shell, clam shell, or limestone grit should be kept before the hens all the time. These feeds supply lime used in the formation of the eggshell. Insufficient lime in the ration will materially lower egg production.

Meat scrap, fish meal, wheat bran, wheat middlings, green feed, and milk all supply considerable mineral matter in the poultry rations. Ordinary meat scrap

contains considerable bone, so that only a little additional bone is needed with this meat.

If high-protein (70 to 80 per cent) meat scrap or vegetable proteins like cottonseed meal are used, the mash should be supplemented with 4 per cent of a mixture of 3 parts ground bone, 1 part ground limestone, and 1 part common salt.

Minerals can best be supplied to the ordinary rations by adding bone meal at the rate of 2 to 5 per cent in the mash, both for chicks and for hens. Both hen and chick mashes should contain 1 per cent salt, and from 2 to 3 per cent of ground limestone may be added to laying mashes. This limestone in the laying mash tends to prevent the laying of soft-shelled eggs. Fine oyster shell or limestone grit should be kept before growing chicks, and are especially necessary as the pullets approach maturity and need lime for egg production.

Lesson No. 7. Getting Good Fertility

The total number of chicks that will be hatched from all the eggs set in the United States this spring will depend upon the proportion of fertile eggs and the hatchability of the fertile eggs, as well as upon the management of the sitting hens and the incubators.

Everyone should realize, of course, that unless an egg is fertile it can not hatch. The proportion of infertile eggs of those set is an important economic factor when it is realized that probably not less than 2,000,000,000 eggs will be incubated this spring.

If 15 per cent of the eggs are infertile, that means a potential loss of 300,000,000 chicks in the number of chicks hatched. That would be a considerable brood of chicks, but it is estimated that at least that many are not hatched in the United States annually which otherwise might have hatched if the fertility of all eggs set were 100 per cent instead of 85 per cent or lower, as is actually the case.

Many farm and commercial flocks do not produce as high as 85 per cent fertility, but as high as 90 per cent should be possible if all conditions are as they

should be. Let us see, therefore, what can be done to enable you to get better fertility in your hatching eggs and consequently a larger brood of chicks.

Essential Conditions for Good Fertility

The first essential is vigorous breeding stock. The breeders must be in the best of health and the quarters must be sanitary. Breeding stock of low vitality usually produce eggs low in fertility and low in hatching quality. Therefore you should select your breeders very carefully for vigor and pay particular attention to the males, because in one sense at least they are half of the flock.

The poultry house should be clean and should have been properly disinfected with an efficient disinfectant, such as a 3 per cent compound cresol disinfectant.

Be sure that the litter in the breeding house is always clean and dry, for it has been demonstrated that dirty and damp litter will cause a lowering in the fertility of hatching eggs.

The breeding stock should be free from lice, and this is easily accomplished if the breeders are dusted thoroughly with a few pinches of sodium fluoride over different parts of the body.

The breeders must be fed well, giving them a variety of grains with the scratch ration fed in the litter to induce plenty of exercise. At the same time, the birds should not be overfed or they are apt to become too fat, which will lower fertility. Proper feeding of the breeding stock is an important matter.

Give the breeders plenty of range. Where the ground is covered with snow for most of the winter and early spring, try to keep a space in front of the breeding house cleared off so that the breeders can get outside on bright days. Sunshine helps fertility.

Another very important matter is not to have the house overcrowded; otherwise fertility will be lowered considerably. Breeding stock should be allowed more floor space per bird than laying stock, and at least 5 square feet per bird should be allowed.

Keep the breeding houses well ventilated but free from drafts, and give the birds comfortable roosting quarters to prevent the combs, especially in the case of the males, from becoming frozen.

Proportions in Mating

The number of females to be mated to one male depends partly on the size of the breeding stock. The following numbers have been found most satisfactory: For Mediterranean breeds, such as Leghorns, put about 15 females with 1 male; for American breeds, such as Plymouth Rocks, Rhode Island Reds, and Wyandottes, put about 12 females with 1 male; and for Asiatic breeds, such as Brahmas, put about 10 females with 1 male.

There are three different kinds of matings made: Stud mating, pen mating, and flock mating.

Stud Mating

In the case of stud mating the males are kept confined in a coop or small yard and one female at a time is put in the breeding pen, and when mating has taken place the hen is removed and later another one is put in with the male.

Stud mating is sometimes practiced by breeders who are trap nesting their females in large flocks but want to mate certain females only to a certain male. This kind of mating is not recommended for the farmer or commercial poultryman, however, because it has been found that continuous confinement of the male tends to reduce his vigor and the fertility of the eggs is apt to be low.

Pen Mating

In pen mating one male is kept in a breeding pen with a pen of from about 10 to 15 females, depending upon the breed and the vigor of the male. The pen is kept by itself during the entire breeding season, and this is the usual kind of mating practiced by the majority of poultrymen who are developing bred-to-lay strains.

Flock Mating

In flock mating all the females and males run together, and the size of the flock may vary from about 25 to several hundred. With a flock of 25 females it

is advisable to use 2 males, and if one is inclined to "boss" the other one around, it is well to use them in the flock on alternate days, keeping one in a coop or small pen by himself and feeding him well the day he is not in the flock.

When the females number about 100 it is well to use about 8 males. Too many males are frequently more objectionable than too few, because they interfere with each other and cause low fertility in the eggs.

Have the breeding flocks mated up at least one month before starting to save the eggs for hatching. Fertile eggs may be obtained the second day after the mating pens are made up, but fertility will not be at its maximum until from two to three weeks later.

The fertility of the eggs should remain fairly high until 10 days after the males are removed from the breeding pens.

If you are practicing pen mating and desire to change males during the hatching season, but wish to know definitely the parentage of all chicks hatched, you should allow three weeks to elapse from the time the first male was taken out of the breeding pen, although the second male could be put in the pen immediately after the first one was taken out.

Gather Hatching Eggs Frequently

Gather the hatching eggs frequently, especially in cold weather. Very cold weather chills the eggs, and if they are not gathered frequently they may become so chilled that the embryos will not even start to develop when the eggs are incubated, even though the eggs are fertile. When the eggs are allowed to become chilled too much, the apparent fertility is higher than the real fertility.

In conclusion, if you want to get the highest possible fertility in the hatching eggs you are going to set this spring, use only vigorous breeding stock, keep the house sanitary, the litter clean and dry, do not overcrowd the houses, give as much range as possible, feed the breeders properly, give them access to as much direct sunlight as possible, use the proper proportion of males, and collect the hatching eggs frequently.

Lesson No. 8. Getting Good Hatchability

How much stock do you put in that old proverb: "Count not your chickens before they are hatched"? Do you believe that the number of chickens that may hatch from a given number of eggs is largely a matter of chance or do you believe that if certain practices are followed a good hatch is almost certain?

If you want our opinion, we would say that much can be done to insure a good hatch and so we are going to tell you some of the things that should be done to get not only a good hatch as far as numbers are concerned, but also good-quality chicks.

Remember, of course, that there are chicks and chicks and that the kind of a chick hatched determines very largely the kind of a pullet or cockerel it will develop into. What every poultryman should be interested in is an increase in the number and an improvement in the quality of chicks hatched from the eggs that are set.

Replacement Necessary

Did you ever stop to think that probably at least two-thirds of the total number of fowls in the United States need to be replaced every year? That is necessary because the chicken is a short-lived creature and egg production decreases as the hen gets old. The average laying hen will lay considerably more eggs in her first laying year than at any other time, so that pullets are depended upon to supply the majority of the eggs going on to the consumers' tables. Also, males up to one year old are much more tender than older males so that most of the males hatched are sold as broilers, fryers, and roasters. These must be replaced every year.

It is estimated that the United States has well over 300,000,000 laying hens, and if two-thirds of these require replacing every year, it means that over 200,000,000 pullets must be raised to maturity every year. That in itself makes a large brood. But that is not all, because about one-half of the chicks hatched

are males, and there is also considerable mortality during the brooding season and even among the adult fowls.

It is impossible to say how many chicks are hatched in the United States every year, but it is an enormous number, and we also know that of the total number of eggs set to produce this enormous number of chicks, probably not over 60 per cent hatch. Some are infertile and hundreds of thousands of fertile eggs do not hatch. Let us see, then, to what extent conditions can be improved.

Two sets of conditions may operate to cause poor hatches. The fault may be with the eggs or the fault may be with methods of incubation. Since a later radio lecture will be given on methods of incubation, we shall pass over this subject at this time and confine our remarks to the problem of producing good hatching eggs.

How to Produce Good Hatching Eggs

Of course, an infertile egg can not hatch, but, on the other hand, there are far too many fertile eggs that do not hatch. In our last radio lecture we told you how to get good fertility, and we can say now that many of the conditions that will produce good fertility will also produce good hatchability.

Vigorous breeding stock well managed is the keynote to success. Cull the breeding flock very carefully just before the commencement of the breeding season. Cull out all unhealthy birds, those that are thin and weak, those with crowlike heads and narrow backs, those that are "baggy" in the abdomen. Pay particular attention to the males, making sure that they have bright, full eyes, broad heads and backs, good depth of bodies, and strong, well-placed legs.

Keep the breeders in sanitary quarters. Be sure the houses have been properly cleaned and thoroughly disinfected and also be sure that the birds are free of lice. Rubbing a few pinches of sodium fluoride well into the feathers over different parts of the body should keep the birds free from lice for a long time.

Keep the litter in the houses clean and dry and do not overcrowd the birds. Give them as much range as winter conditions in your section will allow. Get the breeders outdoors if at all possible. It is better to sacrifice a few eggs by letting the birds out even if it is cold and be sure of getting eggs that will hatch well than to keep them confined all the time.

The breeders should have a rest before the breeding season. After the pullets have completed their first year of laying give them a rest so that they can complete the molt and store up sufficient reserve energy to put into the hatching eggs when the breeding season commences. To give the breeders a rest take away the laying mash for about a month and then about six or eight weeks before the breeding season give them a good breeding mash.

The mash should contain some mineral mixture as explained in our lecture course on feeding the breeding stock. Milk in some form tends to improve the hatchability of the eggs and apparently green food does the same. Then we would also advise putting cod-liver oil either in the mash, mixing a fresh batch of mash and oil about every two weeks, or mixing the oil with the semisolid buttermilk given every day if skim milk is not available. The amount of cod-liver oil to use in the mash mixture is up to about 2 per cent of the weight of the mash. Be sure that the cod-liver oil is potent, because different brands seem to vary a great deal in potency.

Select Large Eggs For Hatching

The size of the egg incubated determines to a large extent the size of the chick. That is, if you set small eggs, you are sure to get small chicks. One objection to using pullets as breeders is that frequently so many small eggs are set. Yearling hens usually lay larger eggs than pullets, and consequently when yearling hens are used as breeders the chicks are not only larger but are also stronger, especially if the yearling hens have been given a rest before the breeding season.

Care of Hatching Eggs

Collect the hatching eggs frequently during cold weather to prevent them from being excessively chilled.

Eggs that are held for incubation purposes should be kept in a room with a temperature of about 60° F. and should not be kept over two weeks. In fact, the fresher the eggs are when put into the incubator or under the hen, the better they will hatch.

Careful Culling Profitable

Cull the hatching eggs very carefully, because every egg that can not hatch represents a loss if incubated. Cull out the small eggs, saving those that weigh 2 ounces each, and cull out the eggs with cracked shells, and if you have white-egg variety cull out all tinted eggs. Rigid culling of the hatching eggs will give you more chicks of better quality.

Finally, then, do everything possible to make sure that eggs produced for hatching purposes are of the highest possible quality. You can not hatch a good chick from a poor egg. The breeding stock must be carefully selected, well managed, and well fed, and the eggs must be given the best of care and should be very thoroughly selected before setting.







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U.S. RADIO FARM SCHOOL

U.S. DEPARTMENT OF
AGRICULTURE

OFFICE OF INFORMATION—RADIO SERVICE

Poultry Short Course No. 4

EXHIBITING FOWLS

LICE AND MITES

December 1, 1926, to
January 19, 1927



*By Specialists of the Bureaus of
Animal Industry and Entomology*



Radio Stations Broadcasting the United States Farm School

(Scheduled on Monday, Wednesday, and Friday, unless otherwise specified)

WGY-----	{ 6.20 p. m., Monday and Friday. 6.45 p. m., Wednesday.
WLS -----	6.15 p. m.
WCCO-----	7.30 p. m.
WOS -----	7 p. m.
KFKX-----	7.15 p. m.
WLW -----	1.40 p. m.
WHO -----	2.15 p. m.
KFXF-----	7.15 p. m.
KHQ -----	5.30 p. m.
KMA -----	11 a. m.
KOIL-----	7 p. m., Monday, Tuesday, and Friday.
KQW -----	6.35 p. m.
KTCL-----	8 p. m., Monday, Thursday, and Friday.
KTHS-----	12 m.
KVOO-----	11.30 a. m.
KWCR-----	8.55 p. m.
WCAE-----	7.10 p. m.
WCSH-----	7.30 p. m.
WEW -----	5 p. m.
WGHP-----	6.40 p. m.
WLBL-----	12.30 p. m., Monday and Wednesday.
WOOD-----	7.35 p. m.
KFBB-----	1.30 p. m.
WMAK-----	6.45 p. m., Wednesday.
WHAM-----	6.45 p. m., Wednesday.
WFBL-----	6.45 p. m., Wednesday.
WEBC-----	7 p. m., Tuesday.

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This is the fourth group of printed lessons on poultry supplementing the U.S. Radio Farm School talks from broadcasting stations listed on inside of cover. All regularly enrolled students in the livestock, poultry, and dairy sections will be furnished the full series of booklets. These publications are mailed at the completion of each short course



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Contents

	Page
Lesson No. 1. Benefits of exhibiting fowls-----	1
Lesson No. 2. Selecting fowls for exhibition-----	3
Lesson No. 3. Preparing fowls for exhibition-----	7
Lesson No. 4. Judging fowls-----	10
Lesson No. 5. Poultry lice and their control-----	13
Lesson No. 6. Chicken mite and how to combat it---	14
Lesson No. 7. Other poultry pests and their control_	15
Lesson No. 8. Methods of management to control pests and disease-----	18

EXHIBITING FOWLS

Lesson No. I. Benefits of Exhibiting Fowls

J. P. QUINN

An exhibit of a few choice birds in a local show may be the first step in the establishment of a successful business. By merely entering his birds, the exhibitor makes known his ownership of stock of a certain breed or variety.

Local newspapers usually publish a list of entries giving this information to neighbors and fellow townsmen. Visitors to the show can secure information as to ownership of birds from the show secretary or supervisor.

In larger shows or State fairs, a catalogue listing the exhibitors is published, and this is available at a nominal price. Additional publicity may be obtained by placing cards on the coops of the birds shown.

Advertising

Superior merit shown in competition is quickly recognized, and a certain amount of free advertising is usually obtained by the winners from press notices during the show. Then, the following month, comes the usual review of poultry shows and comment on the quality of the various breeds and classes in the poultry press.

When a catalogue listing the winners is published, the competitors receive credit for their winnings and this becomes a permanent record for the reference of future buyers. Once the exhibitor has established his position as a successful competitor, the way is open for whatever paid advertising may be deemed profitable.

Sales

Superior quality in a poultry flock can be little more than a local asset until wider markets and better prices are obtained by adequate publicity. It may be that the successful but hitherto rather unknown breeder has been able to obtain fairly profitable prices for only a small portion of his surplus breeding stock.

As the excellent quality of his stock becomes known through the press, the number of inquiries increases, and he is soon able to dispose of his entire surplus at prices showing an excellent profit.

Permanent Success Depends on Quality

While the sales campaign is being pushed energetically, it must not be forgotten that permanent success depends on the quality of the stock.

Close study of young and old stock in the selection of birds to be exhibited should serve to indicate whether breeding tendencies of the stock are in the right direction. Selection of the most promising youngsters brings out ideas that may help in the selection of breeders.

Interesting comparison of old cocks and developing cockerels can be made for bone, substance, and color. Is there too much light color in the young Rhode Island Red stock, or is there a tendency to black in surface and under color? Are the young Barred Rocks quite grayish and uneven in surface color, or is there an improvement in quality of barring and bluish tone of color?

Does the young stock show definite improvement along lines in which the main flock has been somewhat deficient? Are there fewer side sprigs, loose or twisted wings, fewer stubs, and better finish of feather? Do the young birds show quick, thrifty growth and earlier maturity, the pullets quickly coming into full egg production and the cockerels well developed for the early fall shows?

Much to Be Learned at Poultry Shows

Exhibitors can gain much by visiting the show to see their own birds in competition with others. This

practice may force the breeder to put new valuation on many of the characters of his own flock.

His competitors' Barred Rocks at the fall fair may be considerably larger than his own, better finished in feather, and showing fine-scaled shanks of better yellow color. His own stock may be excellent in tone of color and color pattern but may be losing something in body weight, general substance, and early maturity.

Besides comparisons with stock of other breeders, the opinion and suggestions of a competent judge may be extremely valuable. Exacting judges, sincerely devoted to the best interests of the breed, can do more for the improvement of standardbred poultry than almost anyone else.

Poultry Shows Arouse Interest

Every good poultry show has a stimulating effect on poultry interests. A successful annual show in any locality reflects the stability of the industry in that section. The seeds of interest sown by the annual poultry show result in a new annual crop of prospective poultry keepers and their demands for hatching eggs and breeding stock create new business for the established poultrymen.

Exhibitors should aid and support the poultry shows in every way, as the shows, in turn, promote and stimulate public interest.

Lesson No. 2. Selecting Fowls for Exhibition

M. A. JULL

Success in exhibiting fowls depends upon careful work in breeding, growing the young stock, and attention to legitimate methods of conditioning. If the matings were studied carefully, and the chicks well grown, there should be a large number of good-quality specimens available for selection.

As in judging, the guide in selection for novices and veteran breeders is the Standard of Perfection, published by the American Poultry Association at Fort Wayne, Ind.

Write for Farmers' Bulletins

Illustrations of the more popular varieties, standard weights, and a brief description of each variety can be found in Farmers' Bulletins, published by the United States Department of Agriculture. These are listed as follows:

Farmers' Bulletin 878, Mediterranean Class.

Farmers' Bulletin 1052, English, Asiatic and French Classes.

Farmers' Bulletin 1221, Ornamental Breeds and Varieties.

Farmers Bulletin 1251, Bantam Breeds and Varieties.

Farmers' Bulletin 1347, The American Class.

The exhibitor must learn to judge his variety so as to be able to grade birds with accuracy.

Disqualifying Defects

In the application of the Standard of Perfection, certain major defects disqualify a specimen from competition. These are known as general disqualifications.

Among the most common are deformities of body shape; clipped, missing, and twisted wing or tail feathers; side sprigs or excrescences on comb; and stubs on shanks and feet.

For other defects the bird is discounted or cut in points of excellence according to the seriousness of the fault. Common defects are coarseness in head points, irregularity in comb serrations or shape and plumage defects, such as missing feathers or foreign color.

The birds should be examined carefully for breed type as illustrated in the Standard and for surface color, under color, and color of legs and toes as described in the text.

Noticeable early faults are crooked toes, crooked beaks, crooked backs, and knock-knees. A little later, defects in combs of the larger-comb breeds may be easily detected. As feathering progresses, twisted wing feathers may be in evidence as well as slipped wings and wry tail.

A slipped wing is one that is loose and not well folded; this defect is usually found in the Asiatic breeds, sometimes in general-purpose fowls, but rarely in the Leghorn and lighter breeds.

A wry tail is a crooked or bent tail.

Twisted wing feathers are often seen in certain strains of Barred Rocks, and very often will come in straight as adult plumage. Chicks with twisted feathers, however, are usually of the late-maturing, slow-growing type, may fail to reach standard size and weight in time for exhibition, and, as a rule, are quite undesirable.

Color Defects in Young Not Always Permanent

There are, however, certain color defects in the plumage of a youngster that may be entirely changed after the chick molt is over and adult plumage acquired.

For example, the early chick plumage, particularly in wings, of the Rhode Island Red is often rather light colored, but at maturity the bird may have sound red color. Of course, badly off-colored chicks will never be suitable for exhibition.

On the other hand, foreign color may appear in adult plumage of young stock and radical changes in appearance of aged fowls due to fading as well as foreign color.

The careful breeder, with an intimate knowledge of the breeding tendencies of his stock, can estimate fairly accurately the degree of perfection a half-grown specimen is likely to attain.

Choosing Birds for the Show

About three or four weeks before showing, the birds of best all-round excellence should be selected and removed from the rest of the flock. In choosing the birds, the essentials are standard weight, breed type, and color, but care must be taken to select birds of uniformly good quality, discarding any having glaring deficiencies in any one respect.

For example, a Red pullet may have excellent size and outstanding type but be so uneven in color that she would receive no consideration whatever from the judge. A bird of sound color, even if somewhat less pleasing in size and type, would be a better-balanced bird.

Serious defects in legs or feet usually handicap a bird greatly, as the station or carriage is generally affected and symmetry of form destroyed.

Old stock should receive special care throughout the year, as the American breeds are apt to become overfat and lose the excellence of type shown in earlier years.

Leghorns and some of the other light breeds can be shown for three to four and sometimes five years, but the general-purpose fowls undergo changes in type that often make showing impossible after the first year or two.

Treatment of Show Poultry

Hens and cocks should be brought through the molting season on grass range and on a ration reasonably high in protein so as to insure a quick molt and full, lustrous finish of feather by show time.

Well-bred, early hatched young stock will easily mature in time for winter shows. For earlier exhibitions in the fall, a midday feeding of wet mash may be given them to hasten development. Late-hatched, backward cockerels of good promise can be placed in pens of females for the same purpose.

Production Classes

A constructive development of recent years has been the exhibition of fowls in production classes. Hens with official records from laying contests are judged for production and standard quality in special classes. Care should be taken in the selection of production birds from the standpoint of type and size so that individuals shown will be really representative of the breed.

Lesson No. 3. Preparing Fowls for Exhibition

J. P. QUINN

About three or four weeks before showing, the birds of best all-round excellence should be selected and removed from the rest of the flock. It would be well to allow these selected birds the freedom of a grass range until a week before the show so as to keep them in the best possible physical condition, to continue thrifty growth, and to retain the brilliant luster of plumage characteristic of healthy range-raised birds.

A week or 10 days before shipment the birds can be cooped for at least part of the time each day, and during this time they should be accustomed to handling so that the judge will have no difficulty in examining the birds and seeing them at their best.

The birds must not be closely confined for too long a period, however, as they may get out of condition and become unfit for show. By thoroughness in the preparation of his birds the careful exhibitor has an advantage over the slack fitter and may win out over superior birds that are not well groomed.

All varieties of fowls should be washed in order to make the best possible showing if they are to be exhibited at the best shows. Dark-colored fowls, such as Rhode Island Reds and Barred Plymouth Rocks, need not be washed for the smaller shows, unless their plumage is considerably soiled. The head, feet, and shanks, however, of all varieties should be properly cleaned as described later.

Good Practices in Washing Fowls

Before washing the birds, place the exhibition coops a short distance from a stove or other source of heat so that the birds will dry off readily after being washed.

Place clean shavings in the coop, and cover the top, back, and sides of the coop with cloth or paper to prevent a draft. The front of the coop should be left open.

Get three tubs and arrange them on a bench or platform of convenient height. The water in the first tub is to be used for the actual washing and cleaning. The second and third tubs are used for rinsing to remove all the soap. Each tub should contain water enough to cover the body of the bird when immersed, which will be about two-thirds full. If possible to obtain it, clean rain water should be used. Hard water will not produce as satisfactory results as soft water.

Soap and Temperature of Water

Any pure, white, toilet soap may be used for washing. The water in the first tub should be hot but comfortable to the hand, while the water in the second tub should be lukewarm, and in the third, slightly cooler.

Before beginning to wash the fowl, soap the water in the first tub well so that there will be plenty of suds floating on the surface; next, wash the face, comb, wattles, shanks, and feet of the fowl by scrubbing these parts with a small nail brush and plenty of soap and water.

Before actually rubbing the feathers of the fowl, be sure that the water has thoroughly penetrated all sections of the plumage so that the bird is soaked to the skin. Next, apply the soap by working up with the fingers a good lather through all sections of the plumage of the fowl.

Cleaning the Feathers

Rub the lather with the feathers instead of against them. A small sponge helps considerably in applying the lather and in cleaning the wing and tail feathers. Should the feathers, especially those of the tail and wing, be very dirty, the nail brush can be used effectively.

If after the first washing the plumage seems still to be dirty it will be advisable to shampoo the feathers thoroughly a second time before transferring the fowl to the second tub.

Remove as much of the soap as possible from the bird before immersing it in the second tub. The

operator should realize the importance of completely removing all the soap from the feathers in the second and third tubs. When even a trace of soap is left in the feathers it will cause them to appear streaked and to be matted together when dry. In rinsing the feathers be sure to see that the water penetrates all parts of the plumage.

After four or five fowls have been washed, change the water in all the tubs before washing additional fowls.

After the Bath

On removing the fowl from the final tub, remove the surplus water from the feathers by blotting the surface of the feathers with a Turkish towel, but do not rub the feathers with the towel. White fowls may be treated with hydrogen-peroxide solution to make them more attractive. The solution is squeezed slowly from a sponge on to the surface of the feathers, which are allowed to dry without rubbing.

When the fowl is thoroughly dry, examine the shanks and feet closely to make sure that no dirt remains under or around the scales on the legs. Such particles of dirt as do remain may easily be removed with a toothpick.

It is well at this time also to moisten a small cloth with a very little sweet oil or olive oil or vaseline and rub it on the shanks, wattles, ear lobes, face, and comb.

The Shipping Coop

Place a small amount of clean straw or shavings in the bottom of the shipping coop. A cup or can for wheat and corn can be fastened securely in one of the corners of the coop about halfway between the top and the bottom. Feed is unnecessary in the coop if the birds are shipped only a short distance or if they are not to be in the coop more than a day.

Water placed in the coop is likely to be spilled out and soil the plumage, and is not usually necessary.

A tag or card, plainly marked with the address, should be tacked or pasted on the outside where it

can be plainly seen. The coop should be closed securely, but should be made so that it can be opened readily on arrival at the showroom.

Lesson No. 4. Judging Fowls

M. A. JULL

While it is true that some persons possess greater natural aptitude in judging than others, anyone with patience and a little study can easily learn to grade birds, according to their quality, with reasonable accuracy.

The competent judge will see merits and faults, can tell good quality at a glance, but is always willing to change his opinion if the birds do not show up well when handled.

The Standard of Perfection is the guide for both novices and judges—the one to learn values and the other to evaluate birds quickly.

The Expert and the Novice

The expert judge is able to form a very accurate estimate of quality only as a result of a long and thorough training in observing birds and estimating their standard valuations. The novice, in learning to judge values, makes tentative applications of his knowledge, and these are subject to revision as he makes progress in analyzing birds and estimating the proper cuts for the faults he finds.

The professional judge has acquired his own skill and ability, not by intuition, but by constant study and practice, and he is by no means infallible. Judges differ in their ideas of the values of characters, but on the whole their work is generally regarded as accurate as such estimates can possibly be, and furnishes the prevailing opinion as to the best interpretation of the standard.

The decision of the judge, however, must be based on the standard description or a recognized interpretation, and not on his own opinion. Indeed, it can be said that the vast majority of judges are sincerely devoted to the best interests of the breed and have done more than others for its advancement.

Fads and Hobbies Inadvisable

When certain breed fads or hobbies are not allowed to interfere with the best interests of a breed or strain, it is largely due to the shrewdness and foresightedness of the judges.

The abnormally large, white lobe of the Black Spanish resulted in striving for this point at the expense of size and stamina. Birds of weak constitution and poor breed type were used in the breeding pens because they possessed beautiful white lobes.

In a few years, the Black Spanish had lost much of its popularity, and very few are seen in our present-day shows. Parti-colored varieties, in which sacrifices of constitution were made because of excellence in color, have lost materially in popular esteem.

Variations in Breed Type Also Doubtful

Not only has striving for excellence of color and for fineness of head points proved to be disastrous to popularity, but variations in breed type as well have had a similar effect, whenever these have been opposed to the best interests of the breed.

A Rhode Island Red of standard weight is a medium-sized, active bird and usually a good layer, but some of the large, sluggish dromedary types of Reds should not be allowed to win because of greater size, as they are usually inferior, of beefy type, and very ordinary layers.

When the plumage becomes excessively loose and fluffy, as in certain strains of Wyandottes and Cochins, the egg production is apt to be decreased, accompanied by lower fertility.

Up to a few years ago, exceedingly undersized specimens of the lighter breeds were often among the winners when these individuals were of superior quality in other respects. It became generally recognized, however, that Leghorns and Anconas weighing from 1 to 1½ pounds below standard weight were almost invariably layers of eggs so small as to be unmarketable at profitable prices. This situation was remedied in the standard revision of 1923, when Leghorn females more than ½ pound below standard weight were disqualified. Leghorn males, 1 pound below standard weight, are also disqualified.

Any judging practice, fad, or fancy that impairs the utility of a breed for practical purposes is bound to result eventually in loss of popularity. The popular present-day breeds are of undoubted economic value in the production of eggs and meat.

Standard Scale of Points

Under the scale of points as shown in the Standard of Perfection, about equal provision is made for excellence of shape and color in various sections from comb to legs and toes. Type and color are the chief essentials, with symmetry, weight, and general condition almost equally important. By symmetry is generally understood the blending of all sections in a well-balanced bird of typical shape. Weight or size has already been briefly touched upon, and condition gives the judge an opportunity to reward the careful fitter.

Guides for Production Judging

In production judging especially, the birds should first be seen and examined on their feet, as lack of body balance, poor station, bad feet or other weaknesses are most easily seen in this way. Then the bird can be handled for condition of abdomen for width, depth, and skin texture.

Quality of body skin ranks high as a production index. The head is the nerve center of the whole body and indicates temperament. The whole gamut of production quality can be seen in the range from over-refinement in head to extreme beefiness.

Good texture of skin is equally desirable in head points. A broad, wide, and rather long head with bright, prominent eyes in a smooth, full face is most desirable. Alertness, wide-awake disposition and lack of fear are commonly associated with good production temperament.

A broad, flat back with width carried out well to rear of body and depth of body from shoulders to breastbone are necessities in manufacturing equipment, providing adequate space for egg organs and digestive apparatus.

Finally, attention should be given to standard disqualifications, breed type, size, and color. Individuals lacking in breed characteristics should be penalized.

LICE AND MITES

Lesson No. 5. Poultry Lice and Their Control

F. C. BISHOPP

Poultry lice not only cut egg production but they are responsible for the death of chicks and the holding back of growth in young birds.

There are a number of different kinds of lice which commonly infest domestic fowls. While these differ somewhat in appearance, and also in the place where they are usually found on the birds, their habits are very similar. They breed entirely on the chickens, the eggs being cemented to the feathers, and the young lice which hatch from them are active, and resemble the adults in a general way.

They do not live long when removed from their hosts, and are never found to any extent around the roosts or in the chicken runs. In fact, with the sodium fluoride treatment, which is recommended by the Department of Agriculture and very widely used throughout the United States, there is no need to use insecticides in the chicken houses or pens for the purpose of killing lice.

All poultry raisers should note an important difference between lice and mites. The mites feed at night and breed in the chicken houses and not on the fowls.

Treatments for Poultry Lice

The sodium fluoride treatment is both effective and economical.

If comparatively few chickens are to be treated the material may be applied in the form of a dust by what is known as the pinch method. About a dozen small pinches of the material are placed among the feathers next to the skin on each bird. Care should be taken to dust the head and neck to destroy the head louse, the other pinches being scattered here and there about the body, wings, and tail.

When many fowls are to be treated the dipping method will be found easier and more economical. Dipping should be carried out only on warm, sunny days.

The sodium fluoride is dissolved in a tub of water at the rate of 1 ounce to each gallon. The wings of the fowls are held by their bases over the back while the bird is lowered into the dip. The feathers are raised beneath the dip with the other hand so as to allow the material to penetrate to the skin. The head is then ducked and the feathers on the head and neck raised with the fingers after the chicken brings the head out of the dip.

Either of these treatments is 100 per cent effective. Not only are all species of young or mature lice killed but the material is retained in the feathers long enough to kill the young lice as they hatch from the nits.

Treat Before Breeding Season

Sitting hens may be dusted with sodium fluoride, but it is always best to treat the entire flock before the breeding season begins. Treatment of the entire flock during the fall is recommended, so that the birds will be put into the winter free from lice.

Complete information on the control of poultry lice is given in Farmers' Bulletin 801, which can be procured free by applying to the United States Department of Agriculture.

Lesson No. 6. Chicken Mite and How to Combat It

F. C. BISHOPP

The common chicken mite or red mite is an important pest of poultry throughout the United States. While these creatures are small, they make up in numbers what they lack in size. Under favorable conditions they breed very rapidly, and if prompt measures are not taken to destroy them the poultry house may be completely overrun, and they may even cause great annoyance to those who enter the buildings.

Unlike chicken lice, the common mite does not breed among the feathers on the fowls. It is a blood sucker which takes its meals at night and secretes itself in the cracks about the roosts and nests during the daytime.

How to Combat the Mite

In order to combat this pest effectually, it is important that the roosts be built so that they can be examined and treated with ease, and that all unnecessary boards, boxes, and other débris be kept out of the chicken house.

When poultry houses are well cared for, mites may be controlled by occasional applications of whitewash containing about one pint of crude carbolic acid to each gallon of whitewash.

When the premises become badly infested, however, it is best to spray the buildings with the wood preservative known as carbolineum, or with crude petroleum. The spraying should be done with a force pump so that the mites hidden deep in the cracks will be reached, and should be applied in the morning so that the material will dry into the wood before the fowls go to roost.

One thorough application will often completely destroy the mites in a chicken house, but it is usually better to apply carbolineum, or crude petroleum, to the roosts and nests occasionally with a brush.

Lesson No. 7. Other Poultry Pests and Their Control

A. R. LEE

Pests other than lice and mites are not so common and, therefore, do not result in as much total damage, but they do cause big losses to the poultry keeper and greatly reduce the profit in poultry raising. Individual losses are often much greater from these pests than the damage caused by lice and mites.

Rats are one of the worst pests, and not only cause great direct loss by killing young chickens, pigeons; and all kinds of young poultry but also result in

large indirect loss from the grain which they eat and destroy. Constant vigilance must be the poultryman's watchword if his poultry houses harbor rats.

Keep Out the Rats

Poultry houses should be constructed to keep out rats. Concrete floors and walls are great aids in keeping the premises free from these pests.

If houses with wooden floors are used, they should be built from 6 to 12 inches above the ground level to keep the rats from harboring under the buildings.

As soon as signs of rats are seen, immediate steps should be taken to destroy them. Feed hoppers and small coops may be easily moved and the rats dug out and killed. Dogs which are good ratters will help greatly in keeping poultry quarters free from rats.

If these methods do not rid the place of rats the use of traps, of rat poison such as barium carbonate, or fumigating the rat holes with cyanide gas or carbon bisulphide will destroy the pests.

The Predatory Skunk

Another pest which, fortunately, is far less common, but the presence of which is not soon forgotten, is skunks. They do not confine their damage to young chicks but will destroy poultry of any age. Skunks and other rodents of this kind are destroyed by trapping or shooting.

Hawks and Crows Levy Heavy Toll

Hawks and crows cause big losses in each year's crop of chickens in many sections of the country. They do their greatest damage on the late-hatched chickens and usually work entirely on the smaller chickens.

Methods of preventing this loss are to kill or scare away the hawks and crows by shooting or by the use of scarecrows or some device of that kind on the chicken range. A gun should be kept handy wherever hawks and crows are troublesome. All

their nests which can be found in the vicinity should be destroyed.

Hatching all the chicks early will help reduce this loss and this is also a good economic practice.

Where considerable trouble is experienced with hawks and crows, and there is no one to watch the chicks throughout the day, it may be necessary to confine the chicks to very limited range near the houses and not let them have free or extensive range until the chickens are 10 to 12 weeks old. Chicks do best on free range and should not be confined any more than is absolutely necessary.

Other Two-Legged Enemies

Hawks and crows are not the only two-legged thieves attacking poultry, as losses from stealing by human thieves are a big item in many sections near the cities.

Such thieves have been known to steal a truckload of poultry in one evening, often cleaning out an entire poultry flock, and selling the birds in the city markets in other sections. As these men usually work at widely separated points on successive nights, it is very difficult to catch them in the act of stealing. They are more likely to steal from poultry houses which are located a considerable distance away from the dwelling house and which are not locked. In such cases a good defense would be a reliable watch dog.

Organized efforts to combat this thieving have been made by both local and national poultry associations. In some instances poultry keepers have made tattoo marks on their hens so that any that are stolen may be traced in the markets. Where the thieves have been caught efforts have been made to get more severe sentences imposed on the offenders.

City and Town Enemies

Cats and dogs kill a good many chickens in towns and cities. In some cases these animals can be killed, but in thickly populated sections it is often necessary to keep the small chickens confined to covered yards to prevent these losses.

Lesson No. 8. Methods of Management to Control Pests and Disease

M. A. JULL

Sanitation in poultry plants is a subject deserving much more attention than it commonly receives. In many respects it seems, as in the case of the proverbial dog with a few fleas, that the poultry industry is expected to sustain a certain loss from pests and disease as well as from lack of proper sanitation.

Poultry leaders in one of the Southern States have reported that a problem of immediate importance is the prevalence of coccidiosis, roup, chicken pox, and worms. Because of the prevalence of these diseases as well as the damage done by intestinal worms in farm flocks the development of the industry is considerably handicapped.

Controlling Diseases and Parasites

Controlling the diseases and parasites mentioned is largely a problem of management—clean and properly disinfected poultry houses and clean soil.

Roup prevention depends largely on well-built houses that provide plenty of fresh air, but avoid drafts.

Suppressing chicken pox necessitates well-bred, healthy, vigorous stock, housed in dry, well-ventilated poultry houses, and, in addition, it is possible that methods of feeding may also help to control the disease.

Worm control is primarily a production problem also—keeping the birds on clean soil and in clean, properly disinfected poultry houses.

Contaminated Soil a Source of Disease

The chicken gets much of its food directly from the soil, and frequently it is obliged to scratch around in filthy and contaminated places. The particles of food obtained in that way carry thousands of disease organisms.

Even when chicks are confined in brooder houses, and laying hens are confined in laying houses, the fact that they get all of their scratch grain off the floor, which soon becomes contaminated, makes it evident that hygienic conditions would do much to control diseases as well as worm infestation.

Hereditary Diseases and Plagues

Of course, there are certain diseases which apparently are not affected by either the constitution of the birds or by hygienic conditions. Such diseases are infectious bronchitis and European fowl pest, both of which take the strong and fit as well as the weak birds.

Bacillary white diarrhea is a hereditary disease transmitted from adult to chick through the egg, and while sanitary measures on the producing plant will do a good deal to prevent the transmission of the disease among chicks, it has become evident that to eradicate the disease, infected birds must be removed from the flock.

Good Management Will Prevent Disease

The necessity for strict sanitation in the Southern States applies to other parts of the country as well.

When birds get sick it is frequently too late to learn what to do. Good management usually prevents birds from getting sick, and if every farmer took reasonable precautions to keep his poultry houses clean, dry, and draft proof, and, in addition, kept the soil on which the chickens range as clean as possible, he should suffer little loss.

Lice may be controlled very readily by rubbing the birds thoroughly with sodium fluoride, rubbing a few pinches over different parts of the bird's body.

Have Clean, Well-Constructed Poultry Houses

One of the most important features of good management consists in having well-constructed houses. Whether they be brooder houses or laying houses, they should always be kept dry, free from drafts, and strictly clean at all times.

Proper sanitation in the brooder house will do a very great deal toward keeping down coccidiosis as well as bacillary white diarrhea.

In the case of laying houses, roup often develops in the flock as a result of excessive dampness or drafts. Dryness is one of the most essential features in the laying house, and birds will stand a considerable degree of cold if the house is kept dry. A dry house that is free from drafts also helps to prevent chicken pox.

Strict sanitation, and especially the thorough disinfection of the roosts and roosting quarters, helps to control lice and mites.

The Selection of Disinfectants

Farmers and commercial poultrymen should use great care in the selection of disinfectants, because there are some on the market that are not very efficient although they have a strong odor. The value of disinfectants can not be judged by their odor although many people may think so.

Compound solution of cresol is one of the best disinfectants. It contains 50 per cent of cresol. One pint of it added to 10 quarts of soft water makes a solution of proper strength to apply to the houses and equipment.

Soil Sanitation Vital

Soil sanitation is extremely important, as many commercial poultrymen are beginning to realize.

In some sections of the country commercial poultrymen who have had plants in operation for 8 or 10 years are now experiencing severe losses in their growing chicks from worm infestation. This has usually resulted from the fact that they have used the same ground year after year for rearing the chicks.

In many cases the old hens also have become infested with internal parasites.

Treatment of the soil with lime or with acid phosphate, especially where the birds kill off the grass, is advisable. Frequent cultivation tends to bury many of the disease organisms as well as worm eggs and to cause their destruction.

Separate Chicks From Laying Hens

Good management necessitates a change of range for both chicks and laying hens. As a matter of fact, chicks should not be raised with the laying hens. By raising them separate from the old stock it is easier to keep the chicks from getting lice as well as worms.

Since the chicks require considerable range, it is well to keep laying hens confined in a good-sized yard and brooding chicks in colony houses, moving the houses from time to time in order to give the chicks clean soil. Do not forget that healthy chicks can be raised only in clean houses on clean ground. For laying hens provide double yards and grow green stuff in one yard while the other one is being used.

In parts of the country where green stuff can be grown every month in the year, a very good arrangement of yards is to have the triple yard system—one yard in front and two yards at the rear of the house, all yards to be of the same size. By this arrangement the birds can be changed about every four months, or they can be kept in one yard just as long as green food is available, turning them into the next yard after that, and then reseeding the one from which they have just been removed.

This makes an excellent system for keeping the soil sweet and clean, and at the same time provides the birds with an abundant supply of green food the year round.

Proper Feeding Important

Proper feeding is an important phase of good management in order to keep the birds in good health. Contaminated food often causes food poisoning or what is known as botulism.

An abundance of green food at all times not only keeps the chicks and laying stock in better health but tends to prevent the development of nutritional roup.

Cod-liver oil in the ration helps the chicks to assimilate more mineral and thus keeps their bodies in better condition. It also tends to prevent the de-

velopment of leg weakness when fed to growing chicks, and tends to improve hatchability when fed to breeding hens.

In other respects the food given to any class of poultry should always be sweet and wholesome. Musty food frequently causes digestive disorders. Clean water is also necessary, and it should be available at all times.

Selection of Stock

Another important feature of management involves the selection of the stock, including the growing chicks, laying hens, and breeding stock.

Weak birds should be eliminated whenever they appear, also sick birds.

New birds that are purchased should be quarantined for approximately two weeks before being introduced into the flock, and whenever disease appears the diseased specimens should be removed from the flock at once to prevent the disease from spreading to the other birds. It is much more important to prevent the disease from spreading to the other birds than to try to cure the sick one.

Many farmers would find it to their advantage to kill and destroy all diseased birds.

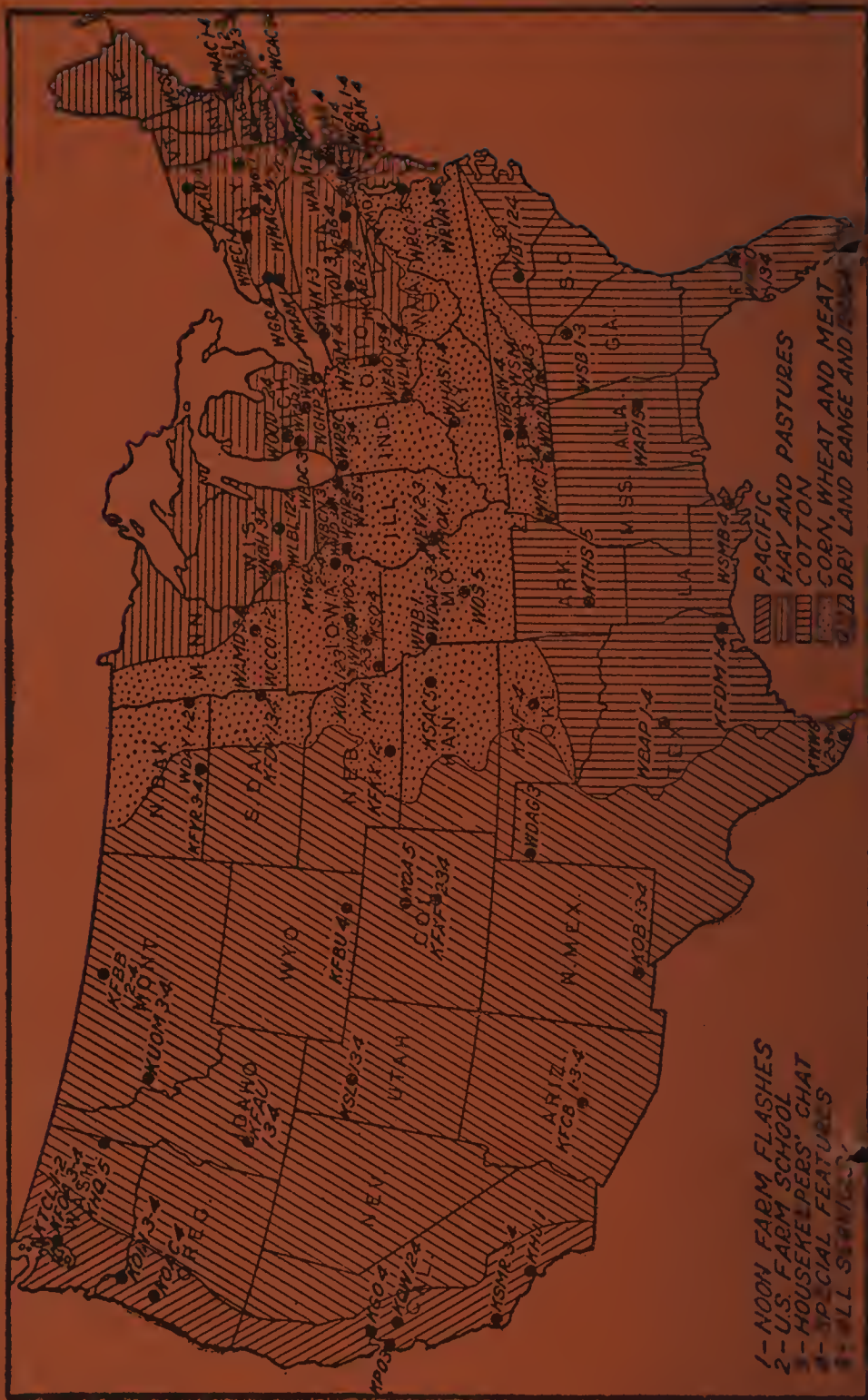
The Sum of Good Management

Proper management to control poultry pests and disease thus includes clean houses, clean equipment, clean soil, wholesome feed, and the rigid selection of all classes of stock at all times.





Broadcasting Stations Cooperating with the U. S. Department of Agriculture



U.S. RADIO FARM SCHOOL

U.S. DEPARTMENT OF
AGRICULTURE

OFFICE OF INFORMATION—RADIO SERVICE

Poultry Short Course No. 5

INCUBATION

January 26, 1927, to
March 16, 1927



*By Specialists of the Bureau of
Animal Industry*



U. S. Government Printing Office

Radio Stations Broadcasting the United States Farm School

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This is the fifth group of printed lessons on poultry supplementing the U. S. Radio Farm School talks from broadcasting stations listed on inside of cover. All regularly enrolled students in the livestock, poultry, and dairy sections will be furnished the full series of booklets. These publications are mailed at the completion of each short course



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Contents

	Page
Lesson No. 1. Value of hatching early -----	1
Lesson No. 2. Selection of eggs -----	4
Lesson No. 3. Hatching with hens -----	6
Lesson No. 4. Advantages of the incubator and its selection -----	9
Lesson No. 5. Operation of the incubator -----	13
Lesson No. 6. Testing the eggs -----	17
Lesson No. 7. Hatching turkeys, ducks, and geese -----	19
Lesson No. 8. Buying baby chicks -----	23

INCUBATION

Lesson No. 1. Value of Hatching Early

M. A. JULL

Profits in poultry raising depend, to a considerable extent, upon fall and early winter egg production. The major portion of poultry receipts is obtained from eggs. This is true of farm poultry raising as well as commercial poultry plants.

In the Middle West 60 per cent of the total poultry receipts are obtained from eggs; and in commercial poultry-raising sections, such as New Jersey and California, eggs bring as high as 85 per cent of the total receipts.

Farmers and commercial poultrymen should realize, therefore, that good fall and winter egg production, when eggs are high in price, determine largely whether the year's work is to show a profit or a loss.

Season of Highest Prices

The price of eggs is highest from about the middle of August to the middle of January.

A record of the average monthly farm prices of eggs from 1910 to 1924 shows that the price is lowest in the month of April, remains fairly steady through to July, and then begins to increase until December, although through January the price still remains at a fairly good figure.

From August to January, therefore, is the season of highest prices, and if egg production is good during this period profits in egg production are increased very materially.

Unfortunately, however, on most farms and at many commercial poultry plants, it is during the fall and early winter months that the old hens are in the process of molting and pullets have not yet begun to lay.

Pullets Chief Source of Fall Eggs

Thousands of farmers lose money simply because they do not hatch their pullets early enough to take advantage of the high prices of eggs during the fall and early winter months.

They fail to realize that pullets are practically the only source of eggs at that time of the year because hens are bound to molt, and they may take anywhere from 30 to 90 days to go through the complete molt.

Poultry producers can not control prices except possibly indirectly, but they can control production to a considerable extent. This can be done by hatching pullets at the proper time of the year so that they will be in good laying condition by the middle of October or fore part of November at the very latest.

Best Time to Hatch for Egg Production

The earlier pullets are hatched the earlier they commence to lay. Moreover, it has been demonstrated that early maturing birds usually make the best annual layers.

Pullets of the Leghorn and similar breeds should come into laying when about six months old, and the heavier breeds, such as Plymouth Rocks, Rhode Island Reds, and Wyandottes, should commence to lay when about seven months old. Therefore, Leghorns should be hatched about six months and the heavier breeds about seven months prior to the middle of October.

This means that for most parts of the country Leghorns should be hatched not later than the last of April, and in the South not later than the middle of April. Heavier breeds should be hatched not later than the middle of April in the North, and in the South somewhat earlier.

Early Hatching Means High-priced Broilers

There are other advantages, also, from hatching early. In the case of early hatched chicks the males may be sold as broilers early in the season, when prices are usually highest.

For instance, chicks hatched about the middle of April could have the males taken out about the middle of July and sold as broilers when the price is usually very good owing to the fact that other kinds of fresh poultry meat are scarce.

Plan to Get Early Fryers and Roasters

Still another advantage of hatching chicks early is that early fryers are for sale before the great bulk of poultry goes on the market in the fall of the year, and also one may have well-matured roasters ready for the Thanksgiving market. An unnecessarily large number of immature, scrawny chickens go to market every year.

Early hatching will do a very great deal to counteract this because the cockerels will have a longer season in which to build a proper frame and then will have some time to put on a finish.

Early Pullets Permit Earlier Culling

Another distinct advantage of early hatching is that the old hens can be culled a little earlier and thus advantage can be taken of higher prices for them on the market.

There are positive advantages, therefore, in hatching early, and farmers and commercial poultrymen should do everything possible to avoid late hatching, since it is rarely as profitable as early hatching.

Lesson No. 2. Selection of Eggs

ALFRED R. LEE

Selection of hatching eggs offers one of the cheapest and quickest ways to improve the breeding flock. Careful selection of eggs for hatching from good breeding stock which is well managed is essential in the production of good chicks.

Guides for Selecting Hatching Eggs

Size, shape, and color of eggs are inherited and are readily influenced by selection. Size is very important because small eggs bring low prices on the market and, if hatched, they tend to make small chicks.

The average weight of an egg should be about 2 ounces, varying from $1\frac{7}{8}$ to $2\frac{1}{8}$ ounces. Very large eggs are not desirable for hatching, and extra large eggs which contain double yolks usually do not hatch at all.

Uniformity of color is important, especially in white eggs. Only chalk-white eggs should be used for hatching in sections where white eggs are demanded by the market. Uniformity in appearance is a big factor in market eggs.

Eggs for hatching should have good shell texture and should be clean.

The Kind to Discard

Abnormal, poorly shaped eggs and long, pointed eggs should be discarded. Long, pointed eggs are apt to be broken in shipment in ordinary egg crates.

All cracked eggs, including those in which the shell is only slightly checked or cracked, should also be discarded. These blind checks or slight cracks may be detected by the difference in the sound of the eggs when they are clicked against each other. Eggs with thin or porous shells usually do not hatch well. Very dirty eggs should not be used, but slightly soiled eggs may be cleaned by rubbing lightly with a damp cloth, care being taken not to rub off any more of the natural bloom of the egg than is absolutely necessary.

Essentials for Good Hatches

Matings should be made from two to three weeks before the eggs are to be saved for hatching, and about 10 days should be allowed if a mating is changed before eggs of the new mating are saved.

Fertile eggs with good vitality are prime essentials in good hatches. These are obtained only from mature breeding stock which is properly housed and which is mated and managed so that health and vigor are kept at the highest point. Pullets should not be used for breeding if it can be avoided.

Fertility in eggs can be accurately determined only after the eggs are incubated. All eggs have a germ spot, which is from one-sixteenth to one-eighth of an inch in diameter, on the upper surface of the yolk. This spot, which can be seen in fresh eggs only by breaking the shell, is found in infertile as well as in fertile eggs.

Freshness Important

Only fresh eggs should be set. Eggs for hatching begin to deteriorate when they are about 5 days old, and none of the eggs should be held over 7 to 10 days if possible to avoid it. Eggs over three weeks old usually will not hatch.

Evaporation takes place in an egg, forming an air cell in the large end which increases in size with the age of the egg. The yolk is held in place by two coiled cords of dense albumen. As an egg becomes older the albumen becomes thinner or weaker, and the yolk tends to settle toward the lower side of the egg.

Care of Hatching Eggs

In freezing weather, eggs for hatching should be collected two or three times a day to prevent chilling.

Eggs which are held for hatching should be kept in a cool, moderately dry place free from draft. An even temperature of from 50° to 60° F. is best. Basements or rooms in incubator cellars are usually the best places to hold hatching eggs.

It is not necessary to turn the eggs unless they are held more than five days, after which they should be turned daily. Various commercial turning devices are

used for this purpose, or the eggs may be kept in cabinet drawers and shuffled about by hand.

How to Ship Eggs

Eggs for hatching may be shipped successfully if they are well packed and carefully handled. A market basket may be used for packing. The basket should be well lined with excelsior, each egg individually packed in excelsior, and the top of the basket covered with cloth. Corrugated paper boxes holding from 15 to 25 eggs are also used for this purpose. Where hatching eggs are shipped in larger quantities, duck-egg fillers are often used in ordinary egg crates. These fillers are large enough to allow each egg to be wrapped individually.

Lesson No. 3. Hatching with Hens

ALFRED R. LEE

Natural incubation, or hatching chicks with hens, is nature's method of changing fertile eggs into chickens. No incubator devised by man has ever hatched better than the hen, but the hen is adapted for hatching only a small number of chicks on general farms where poultry is a side issue and for small, suburban flocks.

The use of incubators or the purchase of day-old chicks is necessary wherever a considerable number of chicks are desired.

Hens do not always want to sit at the time when chicks are desired, especially early in the hatching season, which is often a serious objection to natural incubation. There is no way to make a hen become broody, though early hatching helps to produce pullets which become broody early in the season.

Select Good Mothers

Care is necessary in the selection of broody hens for rearing chickens. A broody hen, or one that desires to sit, makes a clucking noise and ruffles up her feathers when approached.

Most hens of the general-purpose breeds, such as the Plymouth Rocks, Rhode Island Reds, and the Wyandottes, make good mothers.

The heavier class, or meat breeds, including the Brahmas and Cochins, make good sitters, but are inclined to be clumsy on the nest.

The egg breeds, such as the Leghorns, rarely become broody and are not desirable for hatching chicks.

How to Set a Hen

When a hen has become broody, as indicated by her actions and by staying on the nest for two or three successive days, remove her carefully to a nest containing a few china eggs. This nest should be in a quiet place, and it is desirable to make this change after dark. Keep the hen confined to this nest until the second afternoon, when she should be allowed to come off for feed and water. If she then goes back to her nest, remove the china eggs and put under her those to be incubated.

Only 10 eggs should be set under a hen early in the season when the weather is cold, while later in the spring one may put from 12 to 15, according to the size of the hen.

Hens should be set in a room or place where they will not be disturbed by the other poultry. A separate room should be provided if many hens are used, but where only a few hens are set they can be separated from the flock without using an entire pen for this purpose.

System and care in the management of sitting hens will produce a moderate number of chicks without excessive labor.

Style of Nests

Various styles of nests are suitable for sitting hens, a good size being 18 inches square and 8 inches deep. It is advisable to cover each nest with a good-sized, light, wire cover, which prevents the hen from leaving her nest and from disturbing other sitting hens. If the nests are slightly darkened, the hens are less likely to become restless.

Arrangement and Preparation of Nests

The nests may be arranged in tiers, each nest being about 15 inches square and high, with a hinged front which makes a platform for each tier of nests when open. The lower part of the front should be 6 inches high.

It is better to set the nests on the ground if there is enough ground space in the pen. It is desirable to place 3 or 4 inches of damp earth in the bottom of the nest. This earth is covered with the nesting material, which may consist of hay, chaff, or straw. Pack this material down firmly and shape a circular nest out of it, which should be slightly deeper in the center than at the edges, as a nest so shaped prevents the eggs from rolling out from under the hen and becoming chilled.

Care of the Sitting Hen

Confine the hens to the nests, allowing them to come off only once a day to receive feed and water, the feed to consist only of scratch grains, corn and wheat being the best grains. If any of the hens do not desire to come off, they should be taken off. Hens usually return to their nests before there is any danger of the eggs chilling. If they do not go back in half an hour in ordinary weather, they should be put on the nest.

Where a large number of sitters are kept in one room it is advisable to let them off in groups of from four to six at a time. Even with the best of care some hens prove to be fickle mothers and cause trouble and loss in hatching by breaking their eggs, leaving their nests, or trampling on the chickens when first hatched.

Keep Nests Clean

As the hen is closely confined to the nest for 21 days, she must be kept free from lice and mites. The hen should be treated for body lice before she is set by applying pinches of sodium fluoride on different parts of her body.

The nest boxes should be examined for mites and treated if any are found. The eggs and nests should be looked at daily and cleaned if soiled, removing any broken eggs and washing those that are very dirty. Nests containing broken eggs that the hens are allowed to sit on soon become infested with mites and lice, which may cause hens to become restless and leave their nests, often resulting in the loss of valuable sittings of eggs.

Management of Brooding Hens

Two or more hens should be set at one time so that some of the hens can be either reset or put back in the laying pens if many of the eggs are infertile or contain dead germs.

The eggs should be tested after they have been under the hen for seven days, the infertile eggs and those with dead germs removed, and the fertile eggs put back, setting only enough hens to cover the eggs properly.

The broods may also be combined at hatching time if any of the hens hatch only a few chicks, provided the chicks are all of the same color.

Lesson No. 4. Advantages of the Incubator and Its Selection

M. A. JULL

The outstanding advantage of the incubator over the old broody hen is that chicks can be hatched earlier in the season and can be hatched and reared in larger units, thus putting the cost of the reproduction of the flock on a more economic basis.

Many of the flocks of the country are composed of Leghorns. This breed is a nonsitting breed, and incubators or hens of other breeds have to be used.

In other breeds that are bred for egg production, such as the Plymouth Rocks, Rhode Island Reds, and Wyandottes, broody hens are sometimes quite scarce, and in many flocks very few broody hens appear before the breeding season is well advanced. Some

flocks of Rocks and Reds, for instance, have actually had broodiness bred out of them and the hens rarely go broody. In these cases the incubator is a practical necessity.

Large Hatches Possible

Besides this, however, the incubator has the distinct advantage of hatching a few or several hundred chicks at one time, and with the use of the coal-burning stove brooder the problem of reproducing the flock from year to year is very materially simplified.

Desirable Sizes of Flocks

This brings up the matter of the most suitable number of birds for a farmer to keep, especially in order to market his eggs to the best advantage.

While the exact number which any farmer should keep is a matter for him to decide, nevertheless, it may be said that a flock of about 200 or a flock of about 400 would be particularly desirable numbers to keep in order that the management of the flock and the marketing of the eggs from the flocks may be placed upon the most economical basis.

It Pays to Grade Eggs

Too many farmers fail to realize that one reason why they do not receive a higher average price per dozen for their eggs is because their eggs are usually sold ungraded. Small and bad eggs marketed with the good ones results in a lower price being received for all. Where only a few eggs are obtained from a small flock, grading is less likely to be done than in the case of the eggs produced by a good-sized flock.

Advantages of Farm Flock Units

Another important reason for maintaining farm flock units of from 200 to 400 birds is because they allow of dividing the flock to advantage for breeding purposes.

A flock unit of 200, for instance, could readily be divided into two parts—50 yearlings and 150 pullets, and a flock of 400 into 100 yearlings and 300 pullets. The pullets would be used primarily for egg production and the yearlings for breeding purposes.

Yearlings Best as Breeders

Yearlings are preferable to pullets as breeders because they usually lay larger eggs, which hatch into bigger chicks. Moreover, the yearling hens have gone through a molt the preceding fall, and thus have had a rest prior to the breeding season. For this reason yearlings usually produce stronger chicks than pullets.

A still more important reason for using yearlings as breeders is that they should be only the best birds of the pullet flock of the preceding laying year, and this continuous selection from year to year should assist greatly in improving the quality of the pullets raised each year.

Farmers should give much more attention to the selection of their breeding stock every year, and flock units of about 200 or 400 birds will enable them to do it.

Selecting an Incubator

Many reliable makes of incubators are manufactured in this country. The department can not undertake to recommend any particular make.

Some machines have become popular in certain sections of the country because they were advertised extensively in those sections rather than on account of special adaptability to the climatic conditions.

Cheap incubators are less reliable, require more attention, and wear out much more quickly than higher-priced ones. As the value of the machines is small compared with the value of the eggs used during the normal life of an incubator, it is poor economy to purchase a machine which is not reliable.

Whenever possible it is well to select an incubator which is giving satisfaction in your vicinity, so that

you may get the benefit of the experience of other operators there.

There are on the market a large number of different makes of incubators which are being used successfully in various parts of the United States.

These incubators are of two general types, namely, small machines holding from 60 to 400 eggs, usually heated with kerosene lamps, and machines of larger capacity, called mammoth incubators, holding from 2,000 to 10,000 or more eggs each.

Methods of Heating

Most of these large machines are heated by coal stoves with hot-water pipes circulating through the incubator, but lamps are also used for some makes. Gas and electricity are used successfully for both small and large incubators.

Gas is not generally available in many country sections where incubators are ordinarily operated, but the use of electricity in incubation is increasing, although it is too high priced in most sections to be as economical as coal or oil.

Electricity is used more extensively in the extreme western part of the country where electric rates are comparatively low.

The small lamp machines are of two general types—hot air and hot water. Both styles are used successfully in all parts of the country, and there does not seem to be much difference in their comparative value.

The hot-water incubator holds its heat longer than the hot-air machine in case the lamp should go out, but when the incubator receives proper attention the possibility of such an accident is too slight to be worth considering.

The hatching capacity required for the reproduction of the flock from year to year depends on the size of the flock to be reproduced as well as on the number of chickens required to be hatched at one time.

Determining Number of Eggs to Set

In the case of the 200-bird flock, for instance, where 150 pullets are to be placed in the laying houses each

year, we shall suppose that the required number of pullets are to be brought off in two hatches. This means that at least 175 pullets should be raised to maturity to allow culling out 25 of the poorer pullets. One hundred and seventy-five pullets would mean that a flock of 350 chicks would have to be raised, inasmuch as about one-half of the flock would be male birds.

Allowing for about 15 per cent mortality during the rearing season, 350 chicks in the fall of the year would mean that approximately 420 chicks would have to be hatched. Four hundred and twenty chicks hatched in two hatches would require 210 chicks for each hatch, which would mean that about 350 eggs would have to be set at each time, allowing for a 60 per cent hatch to give 200 chicks. For the two hatches, therefore, about 700 eggs would have to be set.

For those farmers who are maintaining an adult flock of 300 pullets and 100 yearlings, double the number of chicks should be hatched at each hatching.

Lesson No. 5. Operation of the Incubator

ALFRED R. LEE

Incubators require careful and proper operation to give large hatches and good chicks. They should be attended to regularly three or four times daily and extra trips made as conditions require. The operation of an incubator is not difficult, but it is very exacting.

The setting up and location of the incubator are important.

Set up the incubator according to the manufacturer's directions and see that the machine is perfectly level and that the regulator works freely.

Heat the incubator and let it dry out thoroughly before trimming the door if it sticks.

Cellar or Basement Best Location

Incubators may be successfully operated in a great variety of places, but a cellar or basement is best

because the temperature and humidity there remain more constant than in a room entirely above ground.

The incubator cellar or room must be well ventilated. Incubators should be placed so that a direct draft does not strike them. A furnace operated in a small cellar tends to make the air too dry and requires the use of additional moisture for good incubation.

Large hatcheries are usually operated in buildings constructed largely or entirely above the ground level.

Regulating the Temperature

An even temperature should be maintained. The incubator should be operated for a few days before the eggs are set. Regulate the incubator before opening the machine, but do not change the regulator any more than is absolutely necessary.

Lamp incubators may be regulated to some extent by adjusting the flame to the room temperature. The thermometer is usually hung up so that the bulb just clears the top of the eggs and should register 102° F. the first week, 102½° to 103° F. the second week, and 103° F. the last week. At hatching time allow the temperature to go up to 103½° or 104°.

If a type of thermometer is used where the bulb touches the egg, the temperature should be held at 101½° to 102° F. the first week, 102° to 103° F. the second week, and 103° F. the third week.

In a good hatch the chicks in the eggs usually begin to pip or break the shells on the evening of the nineteenth day, and most of the chicks will be out of the shell by the morning of the twenty-first day. If the chicks which hatch do not come out about this time it indicates that conditions have not been right during incubation.

Test the Incubator Yearly

It is advisable to test the incubator thermometer in water at a temperature of 103° F. once a year with a clinical thermometer or, if several thermometers are in use, they may be compared with one previously tested and known to be accurate.

Care of the Incubator

The care of the incubator depends on the kind of machine used.

In caring for a lamp machine the lamp should be cleaned and filled and the wick trimmed daily. The lamp should be attended to after the eggs have been handled so that no oil can get on the eggs.

Coal stoves used for heating incubators need well-kept fires so that they will furnish a surplus of heat all of the time, which is taken care of by the automatic heat regulators both on the stove and the incubator sections.

Turning and Cooling the Eggs

Eggs should be turned at least twice daily from the second until the eighteenth day. When the eggs are turned only twice daily by hand reverse the trays. Be careful to turn the eggs gently to avoid cracking or jarring them, as rough handling may prevent the germ from developing.

If the incubators have mechanical turning devices the eggs should be turned three or four times daily.

Eggs are sometimes cooled once daily, from the seventh to the eighteenth day. This depends on the temperature of the incubator room and on the type of machine used. A good general rule is to leave the eggs out of the incubator until they feel slightly cool to the hand, face, or eyelid. The operator should also be guided by the size of the air cell, cooling the eggs longer, and using less moisture if the air cell is not large enough.

Moisture and Ventilation

Moisture and ventilation are closely related factors in incubation, the amount of each depending on the other.

Moisture is used extensively in incubation in the South, in high altitudes, in dry rooms, and in warm weather. The size of the air cell is the best guide to use in judging the amount of moisture needed.

Most moisture gauges are of little value in an incubator, as there is not sufficient circulation of air to allow them to register correctly.

Many methods are used to supply moisture during incubation, such as sprinkling or spraying the eggs with water or placing a pan of water, a receptacle containing moist sand, or a wet sponge in the incubator below the egg tray.

Other common methods of supplying moisture are to sprinkle or soak the floor of the incubator room or to keep a pail of water under the lamp.

Care of Machine at Hatching Time

After the eighteenth day close the incubator and do not open the door until the hatching is over. Do not open the incubator to see how the eggs are hatching, as this allows the moisture to escape, causing many of the chicks to become dry and to stick in the shells.

In a machine with a moisture pan in the bottom, the common practice is to remove this pan just as soon as the hatching is over. The incubator door should be closed as quickly as possible after the pan is removed.

If there is a big hatch so that the chicks are crowded, it is advisable to let some of the chicks go down into the nursing tray before the hatching is entirely completed.

Most machines are arranged with a movable wire piece in front of the egg tray which is opened when the hatch is completed so that the chicks can get down into the nursery tray as soon as they are dried off.

First Care of Chicks

As soon as the chicks are through hatching, remove the dead eggs and shells and place all the chicks in the nursery trays; then set the incubator door slightly ajar to allow ventilation to dry off and harden the chicks before removing them to the brooder.

Keep the temperature in the incubator, taken at the level of the chicks' heads, at about 94° F. for from

36 to 48 hours after the hatch is completed; then remove the chicks to a brooder in a covered box, being careful not to permit them to become chilled while being transferred.

Chicks which pip but are unable to get out of the shell by their own efforts rarely amount to much if helped out, although, if desired, when most of the eggs are hatched and the chicks dried off so that they will not be injured by opening the incubator door, any which have pipped may be helped out by cracking the shell and placing them back on the egg tray.

Lesson No. 6. Testing the Eggs

M. A. JULL

The testing of hatching eggs is important both from the standpoint of securing a successful hatch and from that of economy.

Most people think that testing eggs refers merely to the testing of the eggs while they are being incubated, overlooking the importance of testing eggs before they are put in the incubator.

Appearance of Shell

There are many eggs which may appear to be all right on the surface, but which when tested or candled show that they would be quite unfit for hatching purposes.

Some of the eggs may be very slightly cracked, a condition known as "hair split," and frequently such eggs do not hatch.

Also, there are frequently several eggs in a lot that have shells with a very spotted appearance, which is due to the uneven deposits of calcium. Observation has shown that many of these eggs are infertile or, if they are fertile, they seldom hatch.

Size of Air Cell

It is doubly important that eggs which have been purchased be tested, because their history is unknown.

Their age, for example, can be very readily determined by examining the size of the air cell. In a strictly fresh egg the cell is about the size of a dime, and the older the egg the larger the cell.

In order to get best results in hatching, eggs should not be over 10 days old when placed in the incubator, and at this age the cell should not be much larger than a quarter.

If the eggs you candle have a very large cell, you will know that they are stale or have been held at too high a temperature.

Poultrymen should realize, therefore, that the more carefully the eggs are tested before being placed in the incubator, the greater the chance of securing a good hatch.

When to Test

All eggs should be tested at least twice during the period of incubation, preferably on the seventh and fourteenth days, all infertile eggs and those with dead embryos being removed at the first test, and embryos dying after the first test being removed at the second test.

White eggs can be tested on the fourth or fifth day, but the development in eggs having brown shells often can not be seen by the use of an ordinary egg tester until the seventh day. Eggs with dead germs soon decay and give off a bad odor if allowed to remain in an incubator.

Many operators of mammoth incubators make one test about the fourteenth day, removing all infertile eggs and dead embryos at this time.

Many Styles of Testers

A good, homemade egg tester, or candler, can be made of a box which, set on end, is large enough to inclose the light or lamp. A hole slightly smaller than an egg should be cut in the side of the box at the same level as the light. An electric, gas, or kerosene lamp may be used. If a kerosene lamp or a gas lamp is used, there should also be a good-sized hole at the top end of the box; otherwise the heat from the top of the chimney may set the box on fire.

Some incubator manufacturers furnish with their machines testing chimneys which fit the incubator lamps.

Incubated Eggs Compared

The eggs are tested with the large end up, so that the size of the air cell as well as the condition of the embryo may be seen. The testing should take place in a dark room.

The infertile egg, when held before the hole with the lamp lighted inside the box, looks perfectly clear, the same as a fresh one.

A fertile egg shows a small, dark spot, known as the embryo, with a mass of little blood vessels extending in all directions, if the embryo is living.

If the embryo is dead and the egg has been incubated for at least 46 hours, the blood settles away from the embryo toward the edges of the yolk, forming in some cases an irregular circle of blood, known as a "blood ring." Eggs vary in this respect, some showing only a streak of blood.

The eggs containing strong, living embryos are dark and well filled on the fourteenth day and show a clear, sharp, distinct line of demarcation between the air cell and the growing embryo, while eggs with dead germs show only partial development and lack this clear, distinct outline.

Lesson No. 7. Hatching Turkeys, Ducks, and Geese

ALFRED R. LEE

Both natural and artificial methods of incubation are used successfully in the hatching of turkeys, ducks, and geese, but natural methods are more generally used in the hatching of turkeys and geese, since they are reared almost entirely by natural methods. Artificial methods are used in the hatching of ducks. During the last few years, however, many turkey raisers have practiced artificial incubation with success.

The incubation period is 28 to 29 days for turkey and duck eggs, and 28 to 32 days for goose eggs; but the Muscovy duck requires an incubation period of 33 to 35 days.

Turkeys

In breeding turkeys, from 3 to 15 females may be mated with one male, but if more turkey hens are kept, then more males should be used and the flocks should be separated.

Turkeys usually commence to lay the latter part of the winter or early in the spring, so that their young are hatched when the grass is green. They will lay in secluded places, making it difficult to find their eggs, but the eggs should be collected daily to prevent loss.

Eggs held for incubation should be kept in a room at a temperature of from 50° to 60° F., and it is advisable to turn the eggs daily, handling them carefully. They should not be kept longer than two weeks.

Turkeys will lay a litter of eggs and then go broody. The first litter is usually set under hens and the broody females broken up so that they will lay another litter of eggs, which the turkey hen is usually allowed to incubate.

If a chicken hen is used to incubate the eggs, from 9 to 12 are set, depending on her size, while a turkey hen can cover from 15 to 20 eggs.

If artificial methods of incubation are used, the temperature of the incubator should be run at about 101° F., with the incubator thermometer adjusted so that the bulb just clears the top of the eggs.

The eggs should be turned twice or three times daily, and they should be tested on the tenth and twentieth days.

On the twenty-seventh day the incubator door should be kept closed and not disturbed until about the twenty-ninth or thirtieth day, because it is sometimes 30 days before the last poults have hatched.

Ducks

In raising ducks only 5 should be mated with 1 drake during the cold weather and up to April 1, but later in the season 7 or 8 ducks may be kept with 1 drake. Breeding ducks may be kept successfully in large flocks. The ducks will lay during the winter and the ducklings are hatched to meet market demands.

Ducks, of any breed, rarely sit, so that their eggs are incubated either under hens or artificially.

When hens are used they should be well cared for, since the period of incubation is one week longer than for hen eggs.

It usually takes the ducklings much longer than chicks to get out of the shell; therefore the eggs need more moisture at hatching time, and they should be sprinkled with warm water just before the ducklings are ready to pip.

Artificial methods of incubating duck eggs are commonly used, and incubators are now built especially for this purpose.

The hanging thermometer in the incubator should be so adjusted that the bulb just clears the top of the eggs, and the best temperature for duck eggs is $102\frac{1}{2}^{\circ}$ F. for the first week, 103° up to hatching time, when it should be allowed to reach 104° .

The eggs should be turned twice a day from the third to the twenty-fifth day, inclusive, and they may be cooled from the tenth to the twenty-fifth day.

The eggs are usually tested twice during the incubation period, on the seventh and the twenty-first days, and all infertile eggs and dead germs removed.

The incubator should be kept closed from the time the first duckling pips until the hatching is over.

Duck eggs require more moisture than hen eggs during incubation, and they should be sprinkled with water every day or two after the seventh day and until the ducklings are ready to pip.

Geese

In goose raising, 1 gander is mated with from 1 to 4 females, but pair or trio matings usually give

the best results. They may be allowed to run in flocks during the mating season.

The geese are fed a ration to produce eggs during the latter part of the winter, or so that the goslings will be hatched about the time there is grass pasture.

The eggs should be collected daily and kept in a cool place; they should be set as soon as possible and should not be held longer than two weeks at the most. It is advisable to turn the eggs daily.

A goose will lay a litter of eggs and then go broody. The first litter is set under hens and the broody females are broken up so that they will lay another litter of eggs.

Many breeders prefer to hatch all the goslings under hens as the sitting geese are sometimes hard to manage. From 4 to 6 goose eggs are put under a hen, and from 10 to 11 can be placed under a goose. The eggs set under a hen should be turned by hand as they are too large for the hen to turn readily.

The hen should receive good attention because the period of incubation is longer than for chicks.

If artificial methods are used in the incubation of goose eggs, the incubator should be operated at a temperature of 100° F., with the thermometer so adjusted that it just clears the top of the eggs.

The eggs should be turned from one to three times daily from the third to the twenty-fifth day, inclusive.

Additional moisture should be supplied, as advised for duck eggs, and more cooling is required for goose than for hen eggs. The cooling is done from the tenth to the twenty-fifth day, and the eggs are tested twice during the incubation period.

The incubator should be kept closed from the time the goslings begin to pip until the hatching is over, and the hatching may continue from the twenty-eighth to the thirtieth day.

All kinds of poultry used for incubating purposes should be thoroughly dusted with sodium fluoride to rid them of lice. They should be taken off the nest daily and given clean water to drink and a feed of hard grains.

Lesson No. 8. Buying Baby Chicks

M. A. JULL

The practice of buying baby chicks instead of hatching them is being followed more and more by farmers. This has given rise to the rapid growth and development of the baby-chick industry of the United States.

As a measure of the magnitude of the industry, last year it was estimated that no less than 2,000,000 chicks were hatched in commercial hatcheries alone. Practically all these were sold to farmers and commercial poultrymen.

Often Pays to Buy Chicks

The hatchery business is one illustration of a specialized condition in the industry.

Many farmers and poultrymen apparently feel that it is more economical to buy baby chicks than to spend time operating the incubator to hatch their own chicks.

In many cases it is a much more simple matter to buy chicks and brood them than it is to operate the incubator, and the buying of chicks is really to be recommended when the quality of chicks can be guaranteed.

Select Hatchery with Care

Particular attention should be paid to the kind of hatchery from which the chicks are to be purchased. Above all, care should be taken to avoid buying cheap chicks, because it stands to reason that cheap chicks usually come from low-grade hatcheries, where the eggs frequently were secured in the open market and but little or no attention paid to their selection.

Good chicks can not be produced from poor eggs, and before the farmer or poultryman purchases chicks from a commercial hatchery he should inquire very carefully into the methods employed by the hatchery operator.

To Get Highest Quality

Day-old chicks of the highest quality are produced in those hatcheries where the breeding flocks supplying the eggs for the hatcheries are inspected carefully and handled rigidly, using as breeders only the best birds in the flocks.

The poultry plant where the breeding flocks are maintained should be kept in sanitary condition at all times. The eggs sent to the hatcheries should be of the size as well as uniform in shape, shell color, and shell texture.

Furthermore, the hatcheries where the incubation is carried out should be kept in strictly sanitary condition, and the management of the incubator should be such as to produce the highest possible quality of chicks.

Farmers are strongly advised to buy only good-quality chicks because cheap chicks are frequently of poor quality and give very unsatisfactory results.

Avoid Long-Distance Shipments

Many buyers of baby chicks make the mistake of ordering chicks from a hatchery as far away as possible, which seems to be a case of distant pastures looking green; whereas, as a matter of fact, in many cases just as good-quality chicks, and sometimes better, can be purchased near home. To whatever extent this is possible, the purchasing of chicks near by should be encouraged because it not only saves transportation charges but the chicks spend much less time in transit and should arrive in much better condition than when long-distance shipments are made.

Remember the Postal Regulation

When ordering chicks be sure to keep in mind the postal regulation to the effect that chicks must arrive at their destination within 72 hours from the time they are hatched.

Place Your Order Early

Another precaution to keep in mind when buying baby chicks is to place your order early in the season.

Many of the best hatchery operators who have direct control over their own breeding flocks are booked well in advance. By neglecting to place your order early to insure getting good quality chicks, frequently considerable money is lost by having to buy cheap low-grade chicks later in the season.

When ordering the chicks, remember that the early hatched chick usually is more profitable than the late hatched.

Plan for Fall Laying Time

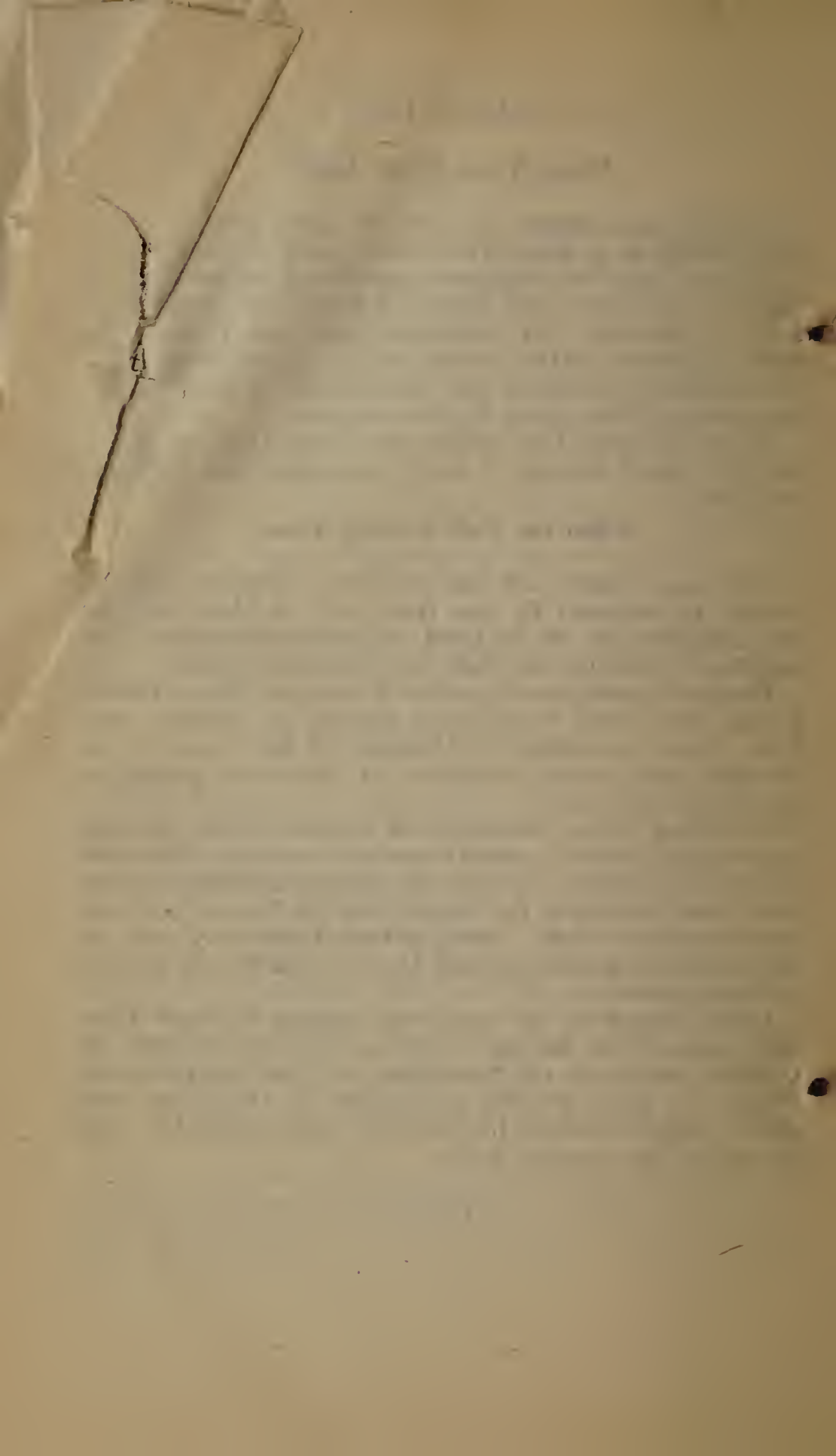
For most parts of the country, Leghorn chicks should be hatched by the fore part of May, if they are required to be in good laying condition by the middle of October or fore part of November.

Heavier breeds, such as the Plymouth Rock, Rhode Island Red, and Wyandotte should be hatched not later than the middle of April, if they are to be brought into laying condition at the most profitable season of the year.

Hatching chicks too early, of course, is not advised unless you have a special market, because they are apt to start laying as early as August and September, and after laying a few eggs may go into a neck or complete body molt. During that time very few, if any, eggs are produced, and this is usually the season of high prices.

Plan, therefore, to buy your chicks so that they will come into laying condition by the middle of October or first of November at the very latest. Chicks of high quality purchased at this time and given proper care will develop into profitable egg producers the coming fall.







Broadcasting Stations Cooperating with the U. S. Department of Agriculture



U.S. RADIO FARM SCHOOL

**U.S. DEPARTMENT OF
AGRICULTURE**

OFFICE OF INFORMATION—RADIO SERVICE

Poultry Short Course No. 6

COMMON POULTRY DISEASES AND WORMS

January 26, 1927, to
March 16, 1927



*By Specialists of the Bureau of
Animal Industry*



U. S. GOVERNMENT PRINTING OFFICE

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*By Specialists of the Bureau of
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This is the sixth group of printed lessons on poultry supplementing the U.S. Radio Farm School talks from broadcasting stations listed on inside of cover. All regularly enrolled students in the livestock, poultry, and dairy sections will be furnished the full series of booklets. These publications are mailed at the completion of each short course



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Contents

	Page
Lesson No. 1. Disease prevention -----	1
Lesson No. 2. Roup of poultry -----	2
Lesson No. 3. Tuberculosis of fowls -----	4
Lesson No. 4. Infectious bronchitis of fowls -----	6
Lesson No. 5. Chicken pox or diphtheria -----	8
Lesson No. 6. Coccidiosis -----	9
Lesson No. 7. Bacillary white diarrhea -----	11
Lesson No. 8. Worm parasites of poultry -----	12

COMMON POULTRY DISEASES AND WORMS

Lesson No. 1. Disease Prevention

HUBERT BUNYEA

In poultry, as in other livestock, it is far better to prevent disease than to attempt to cure it.

In the first place prevention is cheaper. Its cost is trivial when compared with the curtailing effects of disease upon length of life, vigor, and profitable production.

By the application of modern methods and the use of improved equipment, poultry diseases can in many cases be prevented and serious outbreaks nipped in the bud.

Sources of Disease

To prevent diseases, we need to understand something about them. Some diseases are caused by infection; others result from faults of nutrition; and still others are traceable to the general conditions surrounding the flock.

Sanitation of First Importance

The first rule of health is sanitation. The observance of this rule comprises—

Quarantining of new stock until it is known to be healthy.

The protection of the flock from access to polluted drinking water, infected foods, or contaminated grounds.

The burial, burning, or other proper disposal of diseased carcasses.

The thorough cleaning and disinfection of premises contaminated by disease.

Vermin and free-flying birds endanger the health of a poultry flock. So do the visits of a neighbor if he has unhealthy chickens at home.

Feed Balanced Rations

Proper nutrition is the second rule of health. Some diseases are caused by a ration lacking certain elements, while others are due to excessive feeding of some foodstuffs.

Rickets, false roup, and St. Vitus's dance are classed as deficiency diseases, while obesity and gout are attributed to excesses of unbalanced nutrition.

A mixed cereal ration with meat scrap and shell or bone, and a regular allowance of green foods and clean water, should contain all of the vital elements of nutrition required by birds.

Good Surroundings Necessary

The third rule of health is good surroundings, that is, commodious, well-ventilated poultry houses, free from drafts or dampness, and ample opportunity for exercise and suitable exposure to the direct rays of the sun.

Large flocks should be divided into smaller units for convenience in care and feeding as well as an aid to disease prevention. Birds of various ages or of different species should, if possible, be kept separate.

Lesson No. 2. Roup of Poultry

HUBERT BUNYEA

Roup is a catarrh of the eyes and air passages caused by an infective agent the nature of which is not known. It is sometimes associated with the presence of chicken pox in the flock.

This disease is apparently brought on by exposing the birds to draughts, dampness, or chilling.

Various germs have been found in roup, but these may be regarded as incidental or secondary invaders

of the sick bird rather than the actual cause of the disease.

Symptoms

Discharges exude from the eyes and nostrils, at first watery but after several days thick and cloudy.

There is fever and dullness, and the plumage is soiled and unkempt.

Inflammation spreads from the nasal passages to the eyes, which often become sealed with dried exudate, causing the closed lids to bulge with the retained secretions.

Lost eyesight and difficult breathing render the creature indifferent to food.

Weakness and emaciation may ensue, and death soon follows.

Some birds recover after slight attacks.

Preventive Measures

The flock should be well nourished and kept warm and dry. Sunshine by day and proper ventilation at all times are valuable aids in preventing the disease.

Newly purchased chickens or those returning from poultry shows should be quarantined 10 days before being turned in with the flock.

The construction or alteration of poultry houses so as to conform to correct types will assist in preventing roup.

Farmers' Bulletin 1413, "Poultry House Construction," gives helpful information on the subject.

Treatment

Sick birds should be quarantined, or, if the sight of both eyes is lost, the birds should be destroyed.

Burn or bury all carcasses and disinfect the premises. Abscesses beneath the eyes may be lanced, emptied of pus, and then swabbed out with weak tincture of iodine. Sponge the nostrils clean with warm water.

Beginning with the healthy ones, dip the heads of all birds into a 1-to-200 silver-nitrate solution, pre-

pared by dissolving 5 grams of nitrate of silver in 1 quart of rain water.

Give the flock a dose of Epsom salt, then keep all drinking water a grape-juice color with permanganate of potash.

Disinfection of Poultry Houses

All litter and manure should be spread on the fields or burned. Floors, walls, roosts, and droppings boards should be scraped clean.

Nest boxes should be moved out, emptied and scraped, and feed hoppers and water fountains cleaned and scalded. All rotten woodwork should be torn out and burned.

The chicken house should then be sprayed with an approved disinfectant such as cresol compound U. S. P. in 3 to 4 per cent solution.

Infected chicken runs should be scraped to a depth of 4 inches or plowed under and quicklimed.

Ask the Department of Agriculture to furnish you a copy of F. B. 954, entitled "Disinfection of Stables."

Lesson No. 3. Tuberculosis of Fowls

HUBERT BUNYEA

Tuberculosis is a chronic infection of many species of birds, including chickens, pigeons, turkeys, ducks, and geese. It is caused by a germ closely related to those of tuberculosis in man, cattle, and swine.

The disease, which exists in practically all parts of the United States, is very costly to the poultry industry. It is essentially a disease of mature fowls, principally chickens, as it develops very slowly after infection has taken place.

Tuberculosis is not considered hereditary.

Spread of the Disease

The infection may begin by contact with diseased fowls or infected flying birds, or it may be tracked in on the feet of man or animal from neighboring disease centers.

The germs are swallowed by the birds and infect the intestines and related organs. Due to its slow progress and the lack of early symptoms, tuberculosis is seldom recognized in a flock until it has spread to a serious extent. Meanwhile, affected fowls continue to scatter germs in their droppings, thus further disseminating the disease.

Symptoms

After the disease is well advanced, the victim gradually grows weak and becomes progressively emaciated.

The appetite is normal, but persistent diarrhea sometimes develops.

Leg or wing lameness may appear, with swollen joints.

The comb and wattles grow pale, the face has a pinched expression, and the plumage is unkempt.

After prolonged weakness, death ensues.

The liver, spleen, intestines, and occasionally the joints are the principal seats of the disease. The liver is usually swollen and spotted with raised white or yellow nodules.

Control

Have the flock tuberculin-tested by your veterinarian and destroy all reactors. Retest if necessary.

If infection is very heavy, the entire flock must go.

Cleanse and disinfect all houses, runs, and utensils used by the flock, thoroughly wetting everything with the disinfectant, preferably cresol compound U. S. P. in a 3 to 4 per cent watery solution.

Do not restock for several months, and then obtain birds from known healthy stock. Quarantine later additions for 30 days. Have all birds tested before admitting them to the flock.

Birds and Animals Affected

All domesticated birds are, to a certain extent, subject to tuberculosis. Among mammals, swine are

most susceptible to fowl tuberculosis, acquiring it by eating diseased carcasses or infected droppings.

Cattle and persons seldom acquire the poultry type of the disease. However, eating the flesh of tuberculous fowls must be regarded as somewhat hazardous. The finding of tubercle bacilli in the eggs of infected hens is extremely rare, so that the danger of acquiring the disease from the egg is slight. Thorough cooking of the flesh and eggs will, in case of doubt, give assurance of safety.

Parrots and canaries are naturally susceptible to human as well as fowl tuberculosis, and may become disseminators of either type of the disease.

Farmers' Bulletin 1200, discussing fowl tuberculosis, may be obtained from the Department of Agriculture upon request.

Lesson No. 4. Infectious Bronchitis of Fowls

HUBERT BUNYEA

Infectious bronchitis of fowls is sometimes called influenza, or "flu."

This disease is mainly observed among chickens during the fall and winter months, especially in the large poultry-feeding establishments of the Middle West and during shipment of the fowls by rail to the principal poultry markets.

The disease is caused by the presence of a specific, infective agent, the nature of which is not well understood. Cockerels and pullets are more susceptible than older fowls. The disease is readily transmitted among the flock by direct contact, and its spread is favored by overcrowding, long shipment, chilling, undernourishment, and other factors tending to lower the birds' resistance.

Symptoms

There is difficulty in breathing, which causes the bird to extend the head and open the beak for each respiration. This is usually accompanied by a rattling noise caused by obstruction of windpipe by exudates.

The bird becomes ruffled and unkempt and the facial expression is distressed.

The appetite rapidly diminishes.

Sticky matter is present in the mouth and nasal cavity in many cases.

Affected birds may recover. Many cases, however, die in three or four days after exposure, or may succumb after a week or 10 days. Death is apparently due to asphyxiation from the obstruction of the windpipe with dry, cheesy exudates. These exudates are more darkened and fibrinous than those of avian diphtheria, and are found only in the air passages.

Post-Mortem Appearance

Autopsy reveals no significant lesions except an inflammation of the nasal tract and windpipe, which are obstructed with the exudates mentioned, frequently blood tinged. Some cases show pneumonia, but these are the exception and probably represent the more chronic form of the disease.

Prevention

Prevention of the disease is favored by the application of rigid sanitary measures, such as cleaning and disinfecting the premises, isolating all sick birds, burying or burning all carcasses, and providing dry, comfortable, spacious, and correctly ventilated quarters for the flock.

Treatment

Individual cases have been benefited by the repeated mechanical removal of the dried plug of matter from the windpipe, and the daily feeding of a gelatin capsule containing 3 drops each of beechwood creosote and oil of eucalyptus and 6 to 8 drops of castor oil or sweet oil.

A flock treatment by feeding a moist mash containing reduced doses of the beechwood creosote and oil of eucalyptus has been reported as beneficial in some cases. The flock will consume the medicated mash if the odor of the drugs is not too pronounced,

especially at the beginning. Withhold other food for the time being to induce the birds to take the medicated ration first.

Lesson No. 5. Chicken Pox or Diphtheria

HUBERT BUNYEA

Chicken pox is a highly contagious disease which affects numerous species of birds, including chickens, turkeys, geese, ducks, pigeons, and guinea fowls. Some wild birds are also susceptible.

The disease is due to a virus so minute that it is invisible, by the most powerful microscope. Infection probably occurs through abrasions of the skin or sometimes by way of the digestive tract, and the disease may follow in 3 to 12 days.

Symptoms

Chicken pox may run an acute or a chronic course and may terminate favorably or unfavorably, according to the vigor of the bird and the extent of the invasion.

Two distinct types of lesions are manifested: (1) Those appearing as blisters on the skin of the comb, wattles, vent, and other locations, later becoming dried into dark scabs, and (2) those appearing in the form of false membranes on the mucous surfaces of the mouth and air passages. Many times these two manifestations go hand in hand in a single outbreak of the disease.

Affected birds are dull and listless.

Appetite is lacking, and the sick bird stands or sits about with ruffled feathers and head drawn into the plumage.

Owing to the clogging of the nostrils and perhaps the windpipe, the bird breathes with difficulty, and may find it necessary to breath through the mouth, thus further parching the tongue and membranes and aggravating the condition.

Prevention and Treatment

Medicines are of little or no value in treating the disease, but antiseptics placed in the drinking water assist in preventing its spread.

Visibly sick birds should be promptly separated from the flock.

Carcasses should be burned or deeply buried, and the infected premises cleaned and disinfected.

Treatment of the disease largely consists of soaking the pox pustules and diphtheritic membranes, and, after removing them with a blunt instrument, touching the underlying ulcers with tincture of iodine or lunar caustic.

Good housing and correct feeding will also aid in effecting a percentage of recoveries.

Lesson No. 6. Coccidiosis

HUBERT BUNYEA

Coccidiosis is an intestinal disease of young poultry caused by a microscopic, oval parasite known as a coccidium.

Coccidiosis can be distinguished from bacillary white diarrhea, as chicks seldom acquire the latter after the first week. Chicks and poults from 2 to 10 weeks old are more subject to coccidiosis, although older chicks and even occasionally an adult fowl will succumb to the disease.

Symptoms

The young birds appear sleepy and stand about with heads drawn in, feathers ruffled, and wings drooping.

They are indifferent to their surroundings and have no desire for food.

There is a profuse, watery diarrhea, frequently dark-brown or bloodstained.

Emaciation takes place rapidly, attended with great weakness. Death comes in 1 to 2 days.

Young goslings acquire a staggering gait, and often, from weakness, get over on their backs and struggle.

Leg weakness and paralysis occur in older fowls.

Mode of Dissemination

Adult poultry such as brood hens sometimes harbor coccidia in their intestines. Infested pigeons may visit the yard seeking food and contaminate the ground with their droppings. Infected droppings often contain many coccidia eggs.

After incubating for several days on the ground, embryos develop which are capable of establishing themselves in the intestines of their host. This takes place when the chicks swallow these embryos with their food or gravel.

Coccidiosis is not hereditary.

Birds Affected

Practically all domestic fowls are susceptible to coccidiosis. Young chicks and poults are least resistant and suffer the greatest mortality. Young geese and ducks are perhaps less susceptible. Pigeons acquire the disease at any age, with a high death rate.

Adult birds of all species occasionally succumb to the disease. Maturing pullets may develop emaciation and leg weakness as symptoms of chronic coccidiosis.

Apparently healthy hens sometimes harbor the coccidia. Such spreaders are the more dangerous because unsuspected.

Prevention and Treatment

Clean and disinfect brooder coops and houses with cresol compound, 5 per cent solution.

Scrape and plow runs or spade to a depth of 4 or 5 inches.

Segregate young birds from contact with hens or flying birds.

Preferably, raise chicks or poults in brooders and on new, uninfested ground.

Sour milk or buttermilk should be supplied daily.

Drinking water may be medicated by adding one-third teaspoonful each of permanganate of potash and catechu to the gallon.

Lesson No. 7. Bacillary White Diarrhea

HUBERT BUNYEA

Bacillary white diarrhea is a disease of baby chicks which is due to infection with a germ known as *Bacterium pullorum*. These germs sometimes infect the egg-making organs of hens and find their way into some of the eggs which the hens lay. Such eggs when incubated are likely to produce chicks infected with bacillary white diarrhea. Some of these infected chickens die in the shell, many die soon after being hatched, and others grow to maturity and perpetuate the disease.

Symptoms

Bacillary white diarrhea usually appears within the first five days. The chick is droopy and weak, and appears dizzy, running aimlessly in circles or swaying to and fro, meanwhile peeping in a shrill manner as if in pain.

The droppings are white and sticky, sometimes with brownish tinges. This excrement tends to adhere to the downy feathers, and soon completely clogs the vent, thus hastening the death of the chick.

Diagnosis

The age of the chick is of importance in the diagnosis of bacillary white diarrhea. Chicks over a week old seldom die of the disease.

If the tiny carcass is opened, the liver usually presents a yellow appearance. Ordinarily, too, the yolk material, which is nature's provision for nourishing the chick for several days after hatching, will be found unabsorbed in the body cavity.

A bacteriologist can detect the germs in the blood and organs of these chicks.

Prevention

Have the hens' blood tested by a qualified veterinarian and use no reactors for breeding. Some State colleges are prepared to render this service.

Wipe all eggs thoroughly with a cloth wet with denatured alcohol before incubating.

Disinfect the egg trays of your incubator between hatchings.

Disinfect your brooder equipment before you use it.

Have brooder heat properly adjusted and avoid crowding.

Remove weak chicks promptly from the brood.

Burn all carcasses.

No medicine is known which is of value in treating this disease in chicks.

Other baby-chick diseases are sometimes mistaken for bacillary white diarrhea, especially coccidiosis, aspergillosis, and a number of less important bowel infections. These conditions most often occur after the first week and seldom take as quick a toll as bacillary white diarrhea.

Sound feed, bright, clean litter, and general sanitation aid greatly in preventing baby-chick losses.

These conditions are discussed in Farmers' Bulletin 1337, entitled "Diseases of Poultry," which the Department of Agriculture will be glad to send to you.

Lesson No. 8. Worm Parasites of Poultry

ELOISE B. CRAM

The worms which live as parasites in the digestive tract of poultry may seriously affect the health of the birds. The worms give off poisons, cause bleeding, or prevent the food from being properly digested. Birds which are thin and dull, or have pale combs and wattles, or which show either constipation or diarrhea, may possibly have worm parasites which are the cause of the trouble.

Tapeworms

In the intestines of the birds tapeworms may be found. These worms are white and flat and are divided into joints or segments. There are several different kinds of tapeworms in poultry, some so small they are difficult to find; others may be 7 or 8 inches long.

Kamala, a drug given in the form of pills or in capsules, will remove these worms, the dose for a

chicken being 1 gram; for a turkey, 2 grams. Before treating the flock, it is advisable to treat a few birds first, to make sure that the dose is correct.

Roundworms

Other worms which occur in the digestive tract are known as roundworms, to distinguish them from the flat tapeworms. One of these roundworms, found in the intestines, is 3 to 4 inches long and may be present in such large numbers as to block the passage of food. Another, found in the ceca, or blind guts, is about one-half inch long.

The treatment for removing both these roundworms is the same, although it is more difficult to remove those from the ceca. To the mash which is to be fed the birds there is added 2 per cent, by weight, of tobacco dust. This mixture is fed to the flock for three or four weeks.

Other Worms

The tapeworms and the two roundworms mentioned above are the parasites which are most commonly found in poultry, but in addition there are several others which are sometimes the cause of injury or death to the birds.

During the past year, in chickens and turkeys which were dying in large numbers, a very slender, white thread-like worm was found in the walls of the esophagus and crop, seriously damaging those organs.

In flocks of domestic geese the gizzards were found to contain large numbers of another small, white worm, buried in the wall so that the lining of the gizzard was badly damaged, and bleeding resulted.

In both geese and ducks still another kind of roundworm produces serious ulcers in the glandular stomach or large tumors in the gizzard. For these parasites no treatment is known at the present time.

Keep House and Yards Clean

Matters of great importance in preventing poultry from acquiring worm parasites are cleanliness in the

poultry houses and yards and clean food and water, and the removal of any sick birds so that well birds may not be in contact with them.






Worm parasites have especially bad effects on young birds; therefore chicks should be put on clean ground and kept separate from all old birds except the mother hen in order to prevent their picking up the worm eggs in the droppings of the infected chickens.

The Bureau of Animal Industry will be glad to receive any poultry parasites which do not seem to be the common ones mentioned above, and will provide the sender with information concerning them and possible treatment for removing them. As it is difficult to determine the cause of disease or unthriftiness in a flock of poultry, it is advisable for the owner to consult a veterinarian for diagnosis and treatment.





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 CORN, WHEAT AND MILLS
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**U.S. DEPARTMENT OF
AGRICULTURE**

OFFICE OF INFORMATION—RADIO SERVICE

Poultry Short Course No. 7

BROODING AND REARING

March 23, 1927, to

May 11, 1927



*By Specialists of the Bureau of
Animal Industry*



Radio Stations Broadcasting the United States Farm School

(Scheduled on Monday, Wednesday, and Friday, unless otherwise specified)

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This is the seventh group of printed lessons on poultry supplementing the U.S. Radio Farm School talks from broadcasting stations listed on inside of cover. All regularly enrolled students in the livestock, poultry, and dairy sections will be furnished the full series of booklets. These publications are mailed at the completion of each short course



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Contents

	Page
Lesson No. 1. Brooding with hens-----	1
Lesson No. 2. Management of artificial brooders-----	5
Lesson No. 3. Feeding baby chicks-----	7
Lesson No. 4. Brooder houses-----	9
Lesson No. 5. Yards for chicks-----	12
Lesson No. 6. Raising healthy chicks-----	15
Lesson No. 7. Separating the sexes-----	18
Lesson No. 8. Feeding the young stock-----	20

BROODING AND REARING

Lesson No. I. Brooding with Hens

ALFRED R. LEE

Brooding with hens is the simplest and easiest way to raise a small number of chickens, and it is the method which is used very generally by many farmers and by back-yard poultry keepers.

Artificial brooders should be used where 250 or more chickens are raised at one time or where only Leg-horns or other nonsitting breeds of poultry are kept.

Successful natural rearing of chickens requires convenient facilities and regular attention, and as the hen can rear only small flocks of chicks, they usually develop into very good chickens.

Attention at Hatching Time

Sitting hens should be confined to slightly darkened nests at hatching time and should not be disturbed unless they step on or pick their chickens when hatching, in which case the chickens, as soon as dry, should be removed to a basket lined with flannel or some other warm material and kept warm until all the eggs are hatched; or the eggs may be removed and placed under a quieter hen whose eggs are hatching at the same time.

An incubator may also be used to keep the earliest hatched chickens warm, in case they are removed from the nest.

If the eggs hatch unevenly, those which are slow in hatching may be placed under other hens, as hens often get restless after some of the chickens are out, allowing the remaining eggs to become cooled at the very time when steady heat is necessary.

Remove the eggshells and any eggs which have not hatched as soon as the hatching is over.

Feed the Hen but Not Newly Hatched Chicks

Hens should be fed as soon as possible after the eggs are hatched, as feeding tends to keep them quiet; otherwise many hens will leave the nest. At this time, however, do not allow the chicks to have any feed.

In most cases it is best that the hen remain on the nest and brood the chickens for at least 24 hours after the hatching is over.

Combining Two Small Broods

Hens will successfully brood 10 to 15 chickens early in the season, and 15 to 20 in warm weather, depending on the size of the hen.

In many cases the broods of chicks hatched by two hens may be combined and raised under one hen.

When giving chickens to a hen which already has some to brood, it should be borne in mind that it is best to add chicks of the same color and age as those already with her, as the hen will often pick the later arrivals if they are of a color different from those she is already brooding.

This transferring should take place at night, although with a docile hen it sometimes can be done during the day.

To Kill and Prevent Lice

To kill lice, sodium fluoride should be applied to sitting hens before the chicks are hatched. This should prevent the chicks from becoming infested with lice, but if it does not, apply sodium fluoride to the chicks after they are one week old, using only two very small pinches to each chick. One pinch should be distributed on the neck, top of head, and throat, and the other on the back and below the vent.

The hen should be given only three pinches, one on the head and neck, one on the back, and one below the vent.

The treatment should be given to the chicks while they are active, and for a time they should be prevented from hovering, so that the free powder will be shaken off.

Do not use sodium fluoride on young chicks before they are one week old, as it may be injurious to them.

Brood Coops

Chickens hatched during the winter should be brooded in a poultry house, shed, or cellar when the weather is cold. After the weather becomes more favorable they should be reared in brood coops out of doors.

Brood coops should be roomy and so constructed that they can be easily cleaned and sprayed and be closed at night to keep out cats, rats, and other animals, with sufficient ventilation to give the hen and chicks plenty of fresh air.

A good brood coop may be made with a shed or single slope roof, the coop being about 2 by 3 feet. Some brood coops are made A shaped. Good-sized boxes also are often fitted up for brood coops.

The hen should be confined in the coop, or in a small yard attached to the coop, until the chicks are weaned, the chickens being allowed free range after they are a few days old.

The use of a small, covered yard attached to the coop gives the hen more freedom and keeps her in better condition than if she is confined to the coop. The chicks may be kept confined to these coops or yards in wet weather or until the grass dries out in the mornings.

Care to Prevent Loss of Young Chicks

If hens are allowed free range and have to forage for feed for themselves and chicks, they often take the chicks through wet grass, where they may become chilled and die.

Most of the feed the chicks get in this manner goes to keep up the heat of the body, whereas feed eaten by those with a hen that is confined produces more rapid growth, as the chicks do not have so much exercise.

Then, too, in most broods there are one or two chicks that are not so strong as the others, and if the hen is allowed free range the weaker ones often get

behind and out of hearing of the mother's cluck and call. In most cases this results in the loss of these chicks, due to becoming chilled.

Even when the hens are confined the chickens frequently have to be caught and put into their coops during sudden storms, as they are likely to huddle in some hole or corner, where they get chilled or drowned.

They must be kept growing constantly if the best results are to be obtained. Chickens never recover entirely from the effects of checks in their growth even for a short period.

Hens are usually left with their young chicks as long as they will brood them.

Care of the Brood Coop

The brood coop should be cleaned at least once a week and kept free from mites.

If mites are found in the coop, it should be thoroughly cleaned and sprayed with kerosene oil, crude petroleum, or carbolineum, making sure that the spray reaches all the cracks and crevices where the mites may be hiding.

From 1 to 2 inches of sand or dry dirt or a thin layer of fine-cut straw or hay should be spread on the floor of the coop.

Each hen should have a separate coop, and where there are several broods the coops should be placed some distance apart on well-drained soil where the grass is fairly short.

Move Brood Coops Frequently

Brood coops should be moved weekly to fresh ground, preferably where there is new grass.

Shade is very essential in rearing chickens, especially during warm weather; therefore the coops should be placed in the shade whenever possible.

A cornfield makes fine range for young chickens, as they obtain many bugs and worms and have fresh ground to run on most of the time owing to the cultivation of the soil, and have abundant shade at the same time.

Brooding Other Poultry with Hens

Other kinds of poultry, such as turkey poults, ducklings, and goslings, are often brooded under hens. The same methods of brooding are used as with chicks. When turkey poults are about a week old the mother hen should be allowed to roam with her brood, but care should be taken to see that the entire brood returns in the evening and is protected for the night from predatory animals.

Lesson No. 2. Management of Artificial Brooders

M. A. JULL

Given healthy and vigorous chicks as they come from the incubator, it is essential that the conditions of brooding should be such as to promote economical growth.

Brooding systems may be classified as follows, according to their capacity:

Lamp brooders, holding from 25 to 100 chicks.

Electric brooders, accommodating from 50 to 500 chicks.

Stove brooders heated by coal, kerosene, or distillate oil, with a capacity varying from 200 to 1,000 chicks.

Hot-water-pipe systems, the capacity of which is unlimited.

The beginner, if possible, should thoroughly investigate the brooding equipment used successfully by poultrymen or farmers.

Use Reliable Equipment

The selection of the brooder is a very important matter, because the brooding of chicks is frequently a difficult problem.

Cheap, unreliable brooders may easily ruin many broods of good chicks. The few dollars more necessary for a reliable make will be saved the first brooding season through lessened mortality and better growth of the chicks.

Above all, make sure that the brooder is made of good material and that the thermostat is well made. The latter is a particularly important feature because a poorly made thermostat gets out of order easily. Too much heat or too little is equally harmful to young chicks.

Stove brooders are particularly well adapted for farmers who raise about 400 or more chicks annually.

For the farmer who raises about 400 chicks annually two stove brooders would be quite satisfactory, one for the first hatch and another for the second.

For the farmer who raises about 800 chicks annually four stove brooders would be sufficient. They are not expensive to operate, and save a great deal of time in caring for the chicks.

Determining the Correct Temperature

The best temperature at which to keep a brooder depends on the position of the thermometer, the style of the hover, the age of the chicks, and the weather conditions.

Aim to keep the chickens comfortable. When too cold they will crowd together and try to get nearer the heat.

If it is found in the morning that the droppings are well scattered under the hover it is an indication that the chicks have had heat enough.

If the chicks are comfortable at night they will be spread out under the hover of the brooder with the heads of some protruding from under the hover cloth. Too much heat causes them to pant and gasp and sit around with their mouths open.

It is impracticable to state for each style of brooder at what temperature it should be kept. In most cases it should be run at about 95° F. when the chicks are first put in, and stove brooders should be kept at that temperature for the first few weeks because the chicks are able to adjust themselves to the heat, moving nearer or farther from the heat, according to the outside temperature. The temperature is lowered, of course, as the spring season advances and as the chicks start to feather out.

In brooders where chicks do not have the same opportunity to adjust themselves to the heat, the temperature is gradually reduced to 85° F. for the second 10 days, and then lowered to 70° or 75° F. as long as the chicks need heat. This depends somewhat on the season of the year and the number of the chicks, as it can be readily seen that the heat generated by 350 chicks would raise the temperature under the hover to a higher degree than the heat given off by a smaller number; consequently the amount of heat furnished by the lamp or stove will have to be regulated accordingly.

Provide Ample Ventilation

As the chicks grow larger, heat may be supplied only at night, and later, only on cold nights. Care should be taken to prevent chilling or overheating the chicks, which weakens them and may result in bowel trouble.

The heat is usually cut off after the chicks are well feathered. When the chicks are fairly well feathered, low roosts should be placed in the rear of the brooder house. The chicks will soon learn to roost and this will prevent overcrowding on the floor. Poultry raisers should bear in mind that chicks grow rapidly and frequently do not get enough ventilation if allowed to sit on the floor when a few weeks old.

Lesson No. 3. Feeding Baby Chicks

ALFRED R. LEE

Young chicks need very careful attention and good rations to get them properly started in life. They should not be fed until they are from 48 to 60 hours old, as part of the yolk of the egg is absorbed by the chick just before hatching and furnishes nourishment for the first two or three days.

Chickens should be fed regularly four or five times daily after the second day, but should be fed sparingly during the first and second weeks.

Regularity in feeding chicks is of great importance and helps to keep them from developing toe picking and other bad habits.

The all-mash system of feeding chicks has been used successfully during the last year or two, but the more common practice of feeding both scratch feed and mash is recommended for the average poultry raiser.

Protein, Minerals, Vitamins—Three Essentials

Three important points in the selection of a baby-chick ration are protein of good quality, the proper minerals, and a liberal supply of vitamins.

Commercial baby-chick scratch may be fed to advantage under most conditions, as it is difficult to get the individual finely cracked grains.

It is advisable to buy the separate feeds for a home-mixed chick mash, but the commercial chick mash is usually used where only a few chickens are raised.

A good chick mash for the first two weeks may be made of 4 parts by weight of yellow corn meal, 2 parts rolled oats, 2 parts bran, 1 part middlings, $\frac{3}{4}$ part meat scrap, and $\frac{1}{4}$ part dried milk.

Milk is very desirable for young chicks and should be supplied as a drink, if possible, for the first 6 or 8 weeks, in which case the dried milk may be left out of the ration. If no dried milk is used in the mash or fed separately, increase the meat scrap to 1 part.

Boiled infertile eggs are good for baby chicks, and may be used in mixing this mash, omitting the meat scrap and adding 1 part of boiled eggs, by bulk, to 3 parts of mash.

The mash should be fed in flat troughs twice daily and alternated with the commercial baby-chick scratch or a scratch made of equal parts finely cracked yellow corn and cracked wheat.

To Prevent Leg Weakness

Chicks hatched early in the season will develop leg weakness unless they get direct sunlight.

This leg weakness can be prevented by feeding 2 per cent (2 pounds per 100) of cod-liver oil in the mash until the chicks are outdoors most of the time and get plenty of sunlight and green feed, when the oil is no longer necessary.

The oil should be mixed with a small quantity of mash and then incorporated into the entire batch of feed.

To keep the oil from losing some of its value, mix only enough mash with it to last for two weeks.

After two weeks the mash should be changed to 4 parts yellow corn meal, 2 parts bran, $1\frac{1}{2}$ parts middlings, 1 part rolled oats, $1\frac{1}{4}$ parts meat scrap, $\frac{1}{4}$ part bone meal.

This mash should be kept before the chicks all the time and the chick scratch feed given twice daily.

When the chicks are 1 month old, the scratch feed should be changed to a coarser or intermediate chick grain.

After the chicks are 2 months of age, the scratch feed is replaced with equal parts of wheat and yellow cracked corn.

Aids to Rapid Growth

Green feed, sunlight, and a good grass range are very desirable for the best growth of the chicks.

Chicks confined to small bare yards should always be fed green feed, such as cabbage, lawn clippings, cut alfalfa, cut clover, or sprouted oats.

Fine oyster shell, grit, and charcoal, and a constant supply of clean drinking water should be kept before the chicks all of the time.

Water receptacles for young chicks should be arranged so that the chicks can not get into the water.

Lesson No. 4. Brooder Houses

M. A. JULL

The houses in which chicks are brooded and reared should be such as to promote the most efficient growth in the chicks.

A brooder house should provide ample protection from the weather, but should also be well ventilated, because chicks do not do well if brooded in houses where the atmosphere is stuffy. At the same time there should never be a direct draft passing through the house.

The main object is to make the house as comfortable as possible for all occasions.

Keep Chicks Out of Corners

By putting boards or wire netting across the corners of the house the chicks will be prevented from crowding into the corners. This is important because frequently many chicks are smothered as a result of piling up in corners.

Transferring Chicks from Incubator to Brooder

Chickens are usually left in the incubator from 25 to 36 hours after hatching, without feeding, before they are removed to the brooder, which should have been in operation for three or four days at the proper temperature for receiving chickens.

A beginner should try his brooding system carefully before he uses it.

Early mortality in chicks is frequently due to chilling received while taking them from the incubator to the brooder, and failure to have the brooder running properly when the chicks are first put under the hover.

In cool or cold weather they should be moved in a covered basket or other receptacle, and the temperature under the hover should be about 95° F.

Suitable Floor Coverings

The floor of the brooder house should be covered with about 1 inch of cut clover, alfalfa, or straw.

Sand also makes a good covering for the floor, but when used it is essential that the chicks be fed properly. If they are not, then they will eat the sand, sometimes causing loss.

The litter should be removed frequently, as cleanliness is essential in raising chicks successfully.

To Prevent Toe Picking

When chicks are first put into the brooder they should be confined under or around the hover by

placing a board or wire frame guard a few inches outside.

The fence or guard should be moved farther and farther away from the hover and discarded entirely when the chicks are 3 or 4 days old or when they have learned to return to the source of heat.

The chicks should be watched closely to see that they do not huddle or get chilled.

If the chicks start the bad habit of toe picking, remove the wounded chicks and paint their toes with tar. Getting the chicks outdoors will serve to check the habit.

Provide Cool Place for Exercising

Chicks need a cool place for scratching and exercising.

The brooder stove is usually placed in the rear part of the brooder house so that the front of the house will be cooler, or the brooder house may be divided into two sections, one in which the stove is placed and the other a cool room for exercising and feeding.

This arrangement has the distinct advantage of allowing the chicks to get away from the heated section to scratch in the cool section, and this tends to keep the chicks growing and in the best of health. The danger of keeping the chicks too warm is thus avoided, a common mistake in single-room brooder houses.

Precautions Against Disease

The chicks should be allowed to run on the ground whenever the weather is favorable, provided the soil is not contaminated with worm eggs or disease germs.

When the chicks are first allowed outside of the house they should be confined by a wire fence so that they can not get far away. The inclosure should be enlarged after a few days and then taken away altogether.

Be sure the chicks can get in and out of the doorway readily; put a good mound of clean earth at the doorway.

On many poultry plants where trouble has been experienced with coccidiosis and intestinal worms, the chicks are confined to the brooder house or allowed on small concrete yards only for the first two or three weeks.

Keeping the chicks on concrete yards for two or three weeks tends to control coccidiosis, bacillary white diarrhea, and worm infestation.

For further information on diseases and parasites, write for Farmers' Bulletin No. 1337, Diseases of Poultry.

Lesson No. 5. Yards for Chicks

ALFRED R. LEE

The ideal condition for raising chickens is on open range without yards, but under most conditions this is not practical, and yards have to be provided.

While fairly good market chicks can be raised indoors by using cod-liver oil in their feed and providing some direct sunlight, the value of plenty of sunlight, outdoor range, green feed, and exercise in the rearing of chickens for egg production or for breeding can not be overemphasized.

Fences increase the labor cost as well as the cost of equipment and maintenance. They should be few. Land which is divided into small yards is very difficult to cultivate.

Brooding and Rearing

The best way to brood and rear chickens is to have one large yard or field which is fenced to keep the chickens confined to that area and to help prevent losses from dogs, hawks, and rodents.

The chicks may be brooded in colony brooder houses in flocks of about 350 chicks to each house.

The brooder houses should be placed about 125 feet apart each way. At this distance the chickens will not mix much, and the land can be kept fresh and in good condition.

The land should be in good grass sward, and the same field can be maintained and used for four or

five years by this method if the houses are moved each year and the bare spot in front of each house is sown to grass seed in the fall or early in the spring.

The Value of Clean Land

The chickens should be taken away from the range as soon as possible in the late summer or early fall and the land kept free of poultry until spring.

If the soil becomes infested with worms or with disease germs, or if the land can not be kept in good grass, the chickens must be moved to fresh land more often. The value of clean land in growing good chicks can not be overestimated.

In many cases poultrymen will have good results with their chickens the first year or two while the ground is fresh but fail to do so well each succeeding year because of contaminated yards.

Covered Yards Will Exclude Most Pests

Chicks must be kept confined in front of the brooder for the first week or 10 days until they learn to return to their own brooder house. Yards about 12 feet long are suitable for this purpose.

It may be necessary to use yards covered with wire netting to keep hawks, crows, cats, and dogs from killing the small chickens. Later the fences are removed and the chicks allowed to roam at will.

If the hawks and crows cause trouble, it may be necessary to keep the brooder houses quite close together and confine the chicks to a very limited area until they are 6 to 8 weeks old.

Whenever the chicks are moved to a new house or their house is moved to a new site, they should be confined for a few days until they become accustomed to their new surroundings.

Green Yards in Limited Spaces

Where only limited range is available and it is impossible to keep the land in grass, the space should be divided into two yards and one yard sown to a

quick-growing grain crop while the other is used for the chickens.

The chickens are changed to the green yard as soon as the grain is 2 or 3 inches high, and the other yard is sown to such grains as wheat, oats, rye, or barley. A small amount of rapeseed is used during the spring and early summer.

If the chicks are kept in very small flocks, such as in back-yard poultry keeping, the coops may be kept on the lawn or on parts of the garden and moved every few days.

Concrete Yards Sometimes Used

Winter chicks or those raised for broilers in long brooder houses are kept confined to the brooder house much of the time, but they should be allowed to go outside whenever the weather is suitable.

Yards for long brooder houses are usually made from 15 to 50 feet long and the width of the separate pens in the brooder house.

It is very difficult to keep the soil fresh and clean in such yards, and on that account small concrete yards around the brooder house are being used to some extent.

If dirt yards are used they must be turned over frequently or the soil must be replaced with new soil and every effort made to keep the land fresh. Lime also may be applied to help freshen the land.

Chicken-Yard Fences

Fences for chicken yards are usually made from 5½ to 7 feet high, Leghorns or the light breeds requiring the higher fences.

As the chickens approach maturity, it may be necessary to clip their flight feathers on one of their wings to keep them confined.

Either ordinary woven-wire poultry fencing or 2-inch-mesh hexagonal netting is used for large yards or fields, and a strip of 1-inch mesh wire 1 foot high must be used around the bottom of the fence in small yards for baby chicks.

Posts for wire netting are placed 8 to 10 feet apart and for woven-wire fencing, 16 to 20 feet apart. Corner posts should be heavier than line posts and either braced or set in concrete.

Provide Shade and Shelter

Shade is essential in a chicken yard and is best provided by trees and low shrubbery.

If no natural shade is available, artificial shelters of branches or burlap may be provided.

A cornfield provides good shade for chicks and also makes a good range, but it lacks green feed which is so desirable.

Labor on a chicken range may be greatly lessened by having water piped over the range. This may be installed so that it can be shut off during freezing weather, when there are no chickens on the range.

Lesson No. 6. Raising Healthy Chicks

M. A. JULL

Raising healthy chicks is not only more profitable, but also gives much more satisfaction than raising unhealthy chicks.

Probably more farmers and commercial poultry raisers have difficulty with raising chicks than with any other branch of the poultry industry. This difficulty has increased during recent years, partly as a result of the greater intensification of the poultry industry.

Larger numbers of chicks are being raised under artificial conditions, and frequently the land on which the chickens are kept is allowed to become infested with disease organisms and worm eggs. Also, chicks are allowed to run with the old stock from which they become infested with lice.

Other difficulties arise when brooders and the houses are not disinfected regularly.

In other cases, because of intensive breeding methods and lack of proper care in the selection of breeding stock, chicks lack the vitality to withstand unfavorable conditions.

Three Essentials to Health

In order to obtain the best success in raising chicks, three things stand out as of greatest importance:

1. Constitutional vigor of the chicks.

2. Proper methods of feeding.

3. Good surroundings with particular reference to sanitary houses and sanitary soil.

Without constitutional vigor to start with, chicks may neither grow well nor resist disease.

When the breeding stock to produce hatching eggs has not been selected carefully, or when immature pullets have been used, the chicks are frequently very low in vitality and are easily susceptible to the ravages of disease or do not grow well even if fed and cared for properly.

Select Vigorous Breeding Stock

The first principle, therefore, in raising healthy chicks is to use the greatest possible care in the selection of the breeding stock which produces the hatching eggs.

Yearling birds are preferable because they usually lay larger eggs which hatch into larger chicks. Moreover, yearling birds usually have had a rest in the fall, whereas the pullets are usually fed so that they will produce the maximum number of eggs during the winter months, with the result that chicks hatched from their eggs laid in the spring of the year may be weak in vitality.

Breeding stock should be selected from the standpoint of constitutional vigor and body type, using only the most vigorous specimens.

With proper care in the selection of the breeding stock and proper methods of incubation, higher quality chicks should be obtained.

Wholesome Feed Important

Improper feeding may result in bowel trouble or other digestive disorders, and may, in some cases, lead to the development of disease conditions.

Nothing but wholesome feed should be given at any time, and chicks require regular feeding. They should not be fed for about 60 hours after they are hatched, however, because the yolk best supplies the chicks with their first nourishment.

When starting to feed, feed frequently but give very little at a time, and be sure that all feeds used are of the best quality.

Green feed is of particular value in tending to keep the chicks in good physical condition.

Milk also has a decidedly beneficial effect and it has been demonstrated that a liberal feeding of milk tends to counteract the ravages of coccidiosis.

The third important factor in the raising of healthy chicks is that of good surroundings in order that chicks may respond well to the feed given.

The houses in which the chicks have been brooded must be kept clean and sanitary at all times. Frequent thorough disinfection is a good precaution.

The brooder should be operated in such a way that the chicks will never be overheated or become chilled.

Keep Floors and Yards Clean

Another factor of importance is that of maintaining the soil over which chicks range in a sweet and sanitary condition.

It must be remembered that baby chicks get a great deal of their living off the floor of the house or off the ground. This affords an excellent chance for them to pick up disease organisms. It is for this reason that particular attention must be given to frequent cultivation of the soil, and sowing it to a green crop of some kind.

Healthy chicks can not be grown in dirty houses and on contaminated soil.

During recent years a great deal of work in different States has been done to impress upon poultrymen the necessity of raising chicks in clean quarters and on clean land, and one of the best examples of an efficient program along this line is to be found in Connecticut, where the slogan "Health Sticks to Clean Chicks" has been adopted. This slogan should be kept in mind by every poultry raiser.

Lesson No. 7. Separating the Sexes

M. A. JULL

The sexes of growing chicks should be separated at an early date in order to give both the males and the females the best opportunity for growth.

As the chicks approach from 10 to 15 weeks of age, depending upon the breed, the males have a tendency to annoy the females, and there is also the danger of the poultry houses becoming overcrowded through the increase in body size of the chicks.

Many poultrymen fail to realize that a brooder house sufficiently large to accommodate 200 to 300 chicks is not nearly large enough to accommodate approximately the same number of half-grown chickens.

Results of Overcrowding

Overcrowded houses are extremely dangerous, particularly during the warm nights of the summer months.

The atmosphere of the house is liable to become damp and stuffy; the chicks are liable to sweat; and there is not only a lack of proper growth but frequently the vigor of the birds is so weakened that they are much more susceptible to colds and diseases.

When to Separate the Sexes

The proper time to separate the sexes depends partly on the breed and partly on their rate of growth, which in turn has been determined largely by their inheritance as well as by conditions of management.

Under average conditions, however, Leghorn males should be separated from the females at from about 10 to 12 weeks of age.

In the general-purpose breeds, such as Plymouth Rocks, Rhode Island Reds, and Wyandottes, the males

should be separated from the females at from 12 to 14 weeks of age.

In the case of other large breeds, such as Brahmas and Jersey Black Giants, in which sexual maturity is much later, the males may be left with the females up to about 16 to 18 weeks of age.

Males May be Sold as Broilers or Fryers

In many cases, at the time the sexes are separated, the males may be sold as broilers to excellent advantage.

Broilers are chickens weighing from one-half to 2 pounds each, and birds of different breeds will attain this weight at from 10 to 12 weeks of age if they are of good stock and have been managed and fed properly.

One advantage of disposing of surplus cockerels as broilers that are not needed for breeding purposes is that they are sold when there is practically no other fresh poultry on the market, and consequently early broilers should bring a good price.

If the cockerels, when separated, are not sold as broilers, they may still be kept separate and later sold as fryers. Or, if they are kept until the fall of the year, when prices are usually good, they may be sold as roasters.

One distinct advantage of keeping the male birds by themselves is that they will grow and fatten better than when they are kept with the females.

Provide for Development of Pullets

One of the most important reasons, however, for separating the sexes at a fairly early date is that more room may be had in the houses and on the range for the growing pullets. This is a very important matter because, taking the country as a whole, more than half the poultry income is obtained from eggs. Therefore, every consideration should be given to the development of pullets which are to be used as layers during the coming fall and winter seasons.

Lesson No. 8. Feeding the Young Stock

ALFRED R. LEE

Young chickens should be fed so that they will grow steadily and rapidly without any setbacks.

The feed should be regulated so that the pullets will develop large, sturdy frames and mature early in the fall.

There is little danger of overfeeding growing chickens that are on range, as their feed consumption increases very rapidly. Liberal feeding is necessary for proper development and gives the best returns.

Plenty of coop space should be supplied to provide for this rapid chick growth and prevent crowding, which is very detrimental to normal development.

Growing Mash Fed in Hoppers

A growing mash is now kept in hoppers before the chicks all of the time, the hoppers being kept in the yards if possible.

The hoppers should be examined daily to see that plenty of fresh feed is always before the chickens. Either a home-mixed or a commercial growing mash may be used.

A good growing mash may be made of 4 parts yellow corn meal, 2 parts bran, $1\frac{1}{2}$ parts middlings, 1 part rolled oats, $1\frac{1}{4}$ parts meat scrap, $\frac{1}{4}$ part bone meal.

The scratch feed may be made of equal parts of yellow cracked corn and of wheat.

A liberal supply of green feed is desirable and no cod-liver oil is necessary if the chicks have a good outside range.

Chicks which are closely confined or which receive very little green feed should be fed 1 pint of oil in every 100 pounds of their feed. The best chicks are raised on open grass range.

Milk an Excellent Feed

Milk is an excellent addition to all chick rations, and growth can be materially hastened by the use

of milk as a drink in their ration or by mixing milk in the mash.

The use of milk tends to reduce the death rate and helps to prevent toe picking and other bad habits among the chickens.

The larger the flock the greater the danger of picking and of crowding. A good size for a brooder flock is 300 to 400 chicks, which, allowing for some mortality, leaves 125 to 150 pullets in one flock after the cockerels are removed.

Feed Required to Produce Broilers

The cockerels should be separated from the pullets at from 12 to 15 weeks of age, the smaller breeds being separated earlier than the larger breeds.

The cockerels may then be sold as broilers or kept until fall and sold as roasters.

A well-grown Leghorn cockerel will weigh 1 pound at about 8 weeks and 2 pounds at 14 weeks.

A Plymouth Rock will weigh 2 pounds in about 10 weeks and a Rhode Island Red reaches 2 pounds in about 11 weeks.

It takes about 10 pounds of feed to produce a 2-pound Leghorn broiler and 5½ pounds for a 2-pound Plymouth Rock.

Provide Shade on the Range

Shade should be provided on the chicken range or yard, and liberal shade is necessary during the summer months.

The coops or houses should be well ventilated in warm weather by openings both in the front and in the rear of the house.

The house must be kept clean and free from insect pests.

An abundance of clean water is necessary and should be kept in the shade in hot weather.

Fine oyster shell and grit should always be kept before growing chickens.

Influence of Feed on Maturity of Pullets

The time of maturity of the pullets will vary with the breed, with the time of hatching, and with the season.

Ordinarily the pullets should be of good size and ready to start laying early in the fall.

If the pullets are maturing too rapidly late in the summer, their maturity may be retarded either by feeding less mash and more scratch feed or by reducing the quantity of meat scrap or protein in their mash.

If the pullets are not maturing rapidly enough, this condition may be improved by feeding a moist mash once daily mixed with milk in addition to the dry mash.

Chickens which lay too early in the season may lay a few eggs and then go into a partial molt late in the fall or early in the winter when eggs are highest in price.

Pullets that are forced too rapidly and start to lay when they are 4 or 5 months old are inclined to be small and to lay small eggs.



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Poultry Short Course No. 8

SPRING PROBLEMS IN POULTRY MANAGEMENT

March 23, 1927, to
May 11, 1927



*By Specialists of the Bureau of
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This is the eighth group of printed lessons on poultry supplementing the U. S. Radio Farm School talks from broadcasting stations listed on inside of cover. All regularly enrolled students in the livestock, poultry, and dairy sections will be furnished the full series of booklets. These publications are mailed at the completion of each short course



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Contents

	Page
Lesson No. 1. Feeding the layers-----	1
Lesson No. 2. Remove the males from the breeding flocks-----	4
Lesson No. 3. Factors affecting quality of market eggs-----	6
Lesson No. 4. Producing market eggs of high quality--	9
Lesson No. 5. National egg week-----	11
Lesson No. 6. Preserving eggs-----	13
Lesson No. 7. Marketing broilers-----	15
Lesson No. 8. Capons and caponizing-----	18

II

SPRING PROBLEMS IN POULTRY MANAGEMENT

Lesson No. 1. Feeding the Layers

ALFRED R. LEE

Feeding is a very important factor in egg production, because the production of eggs is greatly influenced both by the rations and by the feeding methods.

Well-balanced, palatable feeds are necessary for good egg production, and the additional cost of a good ration, compared with a poor ration, is repaid many times by the extra eggs produced.

The object in feeding is to get the largest returns at the lowest expense.

There is no one best ration for all conditions, but some of the grains can be fed interchangeably, depending on their availability and price.

Elements of Good Rations

A good ration should contain sufficient protein of the right kind, certain vitamins and minerals, and should be properly balanced with carbohydrates.

Meat scraps, fish meal, and milk supply the best proteins for feeding poultry. The value of these feeds should be based largely on their protein content, but milk is also of special value as a supplement to the ration.

The mash should contain about 20 per cent protein and the scratch feed about 10 per cent.

Vegetable Proteins Must be Supplemented With Minerals

The vegetable proteins, such as gluten meal, soybean meal, and cottonseed meal, may also be used, but they are not so good as the animal proteins and

must be supplemented with minerals. Minerals are well supplied through bone meal, limestone and oyster shell, meat scrap, fish meal, and bran.

Laying-hen rations which contain a large per cent of yellow corn and yellow corn meal, a moderate amount of middlings and bran, and which are supplemented with green feed, milk, and lime usually provide sufficient minerals.

It is also important that the hens get the benefit of direct sunlight and a constant supply of oyster shell or limestone grit.

Grains are largely composed of carbohydrates, so this is well supplied in poultry rations.

Two Good Rations

Egg-laying rations are made up of a scratch feed and of a mash containing animal and mineral feed. Green feed, limestone grit or oyster shell, and plenty of water should always be provided.

Green feeds should be supplied freely. Grass or alfalfa range is best, but when this is not available green feed should be supplied daily in the form of germinated oats, cabbage, cut clover, or alfalfa hay, or kale.

Alfalfa meal in the mash is helpful, but other green feed should also be supplied.

Either of the two rations given here will produce good results, or other rations may be made by using similar feeds which may be cheaper and more readily available. All parts are by weight.

Ration 1

MASH		SCRATCH MIXTURE	
	Parts by weight		Parts by weight
Yellow corn meal-----	40	Yellow cracked corn-----	50
Meat scrap-----	20	Wheat-----	25
Ground oats-----	10	Heavy oats-----	25
Middlings-----	10		
Bran-----	10		
Alfalfa meal-----	5		
Bone meal-----	2		
Ground limestone-----	2		
Salt-----	1		

Ration 2

MASH		SCRATCH MIXTURE	
Yellow corn meal-----	40	Yellow cracked corn-----	40
Middlings-----	20	Wheat-----	30
Bran-----	10	Heavy oats-----	30
Meat scrap-----	10		
Fish meal-----	7		
Alfalfa meal-----	5		
Dried milk-----	3		
Bone meal-----	2		
Ground limestone-----	2		
Salt-----	1		

These rations may be supplemented with milk to increase egg production, using either semisolid or ordinary buttermilk or skim milk.

Commercial Feeds Handy for Small Flocks

A large number of commercial feeds of both scratch grains and mashes are manufactured and sold for poultry feeding. Most of these commercial feeds are usually of good quality and may be used to advantage.

The value of any commercial feed depends on its composition and on the kinds and quality of the grains used in its preparation.

When only a few hens are kept, it is simpler to use these mixed feeds, but it is usually cheaper to mix the rations for large flocks kept on poultry farms and also for flocks on general farms where part of the ration is home grown.

Methods of Feeding

The scratch mixture should be fed twice daily, giving about one-third of the grain early in the morning and the rest in the afternoon. Regularity in feeding is important.

The mash is usually fed dry and is kept in an open hopper before the hens all of the time.

To provide a properly balanced ration, the average feed for the year should be half scratch feed and half mash. This is accomplished by regulating the

amount of scratch feed so that the pullets in the fall will eat about two-thirds scratch feed and one-third mash, about equal parts of each during the winter, and two-thirds mash and one-third scratch in the late spring and in the summer. This should be regulated according to the condition of the fowls and their egg production.

The pullets should be kept in good flesh in the fall and winter, which is accomplished by feeding the scratch mixture freely.

Lesson No. 2. Remove the Males From the Breeding Flocks

M. A. JULL

Farmers and commercial poultrymen seldom stop to think that in the long run the price of any commodity is very largely determined by its quality. This is particularly true of eggs during the summer months.

The law of supply and demand has a direct bearing on the problem, but it is also well to keep in mind that the low prices of summer eggs are frequently caused by their very inferior quality.

Factors Affecting Quality

The egg is one of the few foods of animal origin prepared in a natural package ready for consumption.

It must be borne in mind, however, that the shell is porous, and that in warm weather the watery content of the egg tends to escape through the shell. This is one reason why eggs produced during the summer months are rarely of the same quality as eggs produced in the early spring, when the weather is cooler.

A much more important factor affecting quality, however, has to do with germ development during warm weather.

As is well known, on the great majority of farms there are lots of hens that go broody in the spring

months, and frequently they are allowed to sit on newly laid eggs. Also, male birds are allowed to stay with the females throughout most of the summer, or all summer, with the result that many fertile eggs are produced.

Gather Eggs Frequently

When a broody hen sits on a fertile egg for as short a time as 12 hours, the germ begins to develop, and it will start to develop in eggs remaining in an air temperature of 90° or 95° F. There are many poultry houses where the temperature easily reaches 90° F. during the summer months.

Eggs that are laid in hidden nests and those that are not gathered frequently are spoiled before they are collected, although many farmers do not hesitate to market them. This, in turn, lowers the price of all other eggs on the market, and tends to retard consumption.

Produce Infertile Eggs

The best way to keep them from spoiling, however, is to produce infertile eggs.

The production of fertile eggs during the summer months is one of the principal causes of the poor quality of eggs marketed. In other words, farmers can do more to improve the quality of eggs during the summer months by removing the male birds from the flocks immediately after the breeding season is over than in any other way. By doing so, other troubles in the egg industry are automatically removed.

Lesson No. 3. Factors Affecting Quality of Market Eggs

M. A. JULL

The egg is rich in nutritive properties but perishable, and everything possible should be done from the time the egg is laid to preserve its quality.

The white, or albumen, of the egg is rich in protein, which serves human beings very efficiently in the development of tissue.

The yolk is rich in fat, which supplies us with fuel and energy-building material. The yolk also contains vitamins, which are of such great importance in the preparation of adequate diets for humans.

Then again, eggs are relatively rich in minerals, and mineral balance in the diet is a very important matter.

How to Judge the Quality of Eggs

Five points should be considered when judging an egg for quality—the shell, the air cell, the yolk, the white or albumen, and the germ. Of these five factors the first has to do with the exterior of the egg, and all the others have to do with the interior.

The shell of the egg affects quality because it is porous and will allow the water to escape from the egg and may permit gases and bad odors to enter the egg.

The shell should be strong to prevent breakage, and it is quite necessary that it be clean. Filth and dirt adhering to the shells may be responsible for micro-organisms entering the interior.

Reasons for Not Washing Eggs

On the other hand, if the shell is washed the bloom which covers a fresh egg is rubbed off and the pores are exposed, thus allowing an excessive evaporation of the watery content of the egg.

Moreover, a washed shell allows eggs to absorb odors very readily. This can be demonstrated by

placing eggs in an empty lemon or onion crate, which merchants sometimes do.

A cool room that is free from objectionable odors should therefore be selected for storing eggs.

Air Cell Is a Guide to Age

The older an egg becomes the larger is the air cell, which is usually at the large end of the egg; in fact, the size of the air cell is a good indication of the age of the egg, when eggs have been kept under normal condition.

It is true that the air cell increases in size much more rapidly in hot than in cool weather, so that an egg two days after it is laid in summer may appear much older than an egg seven days old which had been laid in October or November.

In a strictly fresh egg, the air cell should be small, not over three-sixteenths of an inch in depth, measured from the end of the shell to the bottom of the air cell. Also, in an egg of the best quality the air cell occupies a fixed position and should not be movable.

Common Changes in the Yolk

The quality of the yolk has a great deal to do with determining the relative quality of the egg because changes in the condition of the yolk are more rapid and more readily observable than changes in the white around it.

The yolk of a new-laid egg should be only dimly visible when it is tested before the candling apparatus.

When the egg is broken the yolk should be of a bright yellow color and should stand up well, whereas a yolk that tends to lie flattened out indicates a stale egg.

Feed Affects the Color of the Yolk

The kind of feed given the laying hens, of course, affects the color of the yolk to some extent.

Yellow corn, for instance, will produce a much darker colored yolk than white corn, but yellow corn is a better feed for poultry than white corn.

Green feed will also tend to make a dark-colored yolk.

Certain kinds of feed given may also affect the flavor of the egg.

The White or Albumen

When candled, the white or albumen of a fresh egg should be clear and should appear fairly firm and not watery.

When the egg is broken the white should really appear in two parts—the thinner part on the outside, which tends to flatten out in the dish, and the thicker portion, which stands up well immediately surrounding the yolk. The degree to which the thicker portion stands up is a good indication of the relative age of the egg.

Blood Spots Visible by Candling

In some eggs blood spots may occur, especially in the spring of the year when the hens are laying heavily. These blood spots do not materially affect the edible quality of the egg, but they look objectionable when eggs are prepared for breakfast.

Many poultrymen who candle their eggs before marketing keep at home for cooking purposes the eggs containing the blood spots. The eggs are perfectly good, and when opened the blood spots can easily be removed.

Produce Infertile Eggs

One of the most important factors affecting the quality of an egg is the condition of the germ.

The germ, or embryo, starts to develop at a temperature of approximately 80° F.

In warm weather especially farmers are very liable to offer on the market eggs containing partially hatched chicks, if the male birds are left with the flocks.

Such eggs are most objectionable and cause a reduction in the average price of all eggs marketed. The simple way to avoid this is to remove the male birds from the laying flocks immediately after the breeding season is over.

Lesson No. 4. Producing Market Eggs of High Quality

M. A. JULL

Eggs deteriorate in quality in several ways, two of which are of outstanding importance.

In the first place, millions of dollars are lost to the poultry industry every year through farmers placing on the market eggs in which the embryos have started to develop. This is due very largely to the fact that farmers do not remove the male birds from the breeding flocks after the breeding season is over.

The other outstanding factor affecting the quality of eggs before they reach the consumer is shrinkage, caused by the evaporation of the watery content of the egg. The older the egg and the higher the temperature in which it is kept, the more the contents of the egg shrink and the larger the air cell becomes.

Farmers, therefore, should take every precaution to see that eggs are kept in reasonably cool places before being marketed and that they are marketed as regularly and as frequently as possible, preferably twice a week in warm weather and at least once a week at other times in the year. They should never forget that an egg does not improve with age, and the sooner it is marketed the better.

Marketing Hints

There are a number of other ways whereby the farmer can improve the quality of eggs and at the same time receive a higher price for his product.

Only clean eggs should be marketed; dirty eggs not only look bad but sell less readily.

Careful attention should be paid to the color of the eggs, particularly if white-shelled eggs are being produced, and to the size of the eggs, because consumers are becoming discriminating in these respects.

Careful analysis of egg losses from all causes shows that farmers are responsible for about one-half the total. That is to say, practically half the loss can be eliminated if farmers will take proper care in the production and handling of their eggs up to marketing time, the other half being due largely to faulty methods of marketing.

Ways to Improve Quality

Various daily management practices enable farmers to improve greatly the quality of eggs.

Laying stock should be kept on clean land.

Houses and the nests should be kept clean at all times.

The eggs should be gathered frequently, especially in very warm and very cold weather, twice a day being none too often.

It must be remembered that in warm weather, when the temperature is from 80° F. upwards, the contents of the egg tend to evaporate rather rapidly, and eggs will become stale quickly if left in the nests. The same is also true if broody hens are allowed to sit on either infertile or fertile eggs.

Eggs should never be left exposed to the direct rays of the sun.

Candling and Grading

It is a very good practice to candle all eggs as a safeguard against blood spots and to make sure that no stale eggs are marketed. Candling is one of the most efficient methods of learning the quality of eggs.

Combined with candling, it is frequently profitable to grade the eggs according to size.

When a sufficient number of eggs are being produced to justify candling and grading, this is frequently well worth while because a premium can be obtained for the highest grades of eggs.

Color an Important Price Factor in Some Markets

In the production and marketing of eggs careful attention should also be given to color, especially where white-shelled eggs are being produced.

Many White Leghorn breeders have experienced difficulty in respect to the color of shell.

In some flocks the proportion of eggs with tinted shells is relatively high, and since New York and some other markets show a preference for white-shelled eggs, those with tinted shells are discounted. Entire shipments of eggs containing both white and tinted shelled eggs are frequently discounted in price.

The production of white-shelled eggs is largely a matter of breeding, and tinted-shelled eggs can be eliminated by careful selection of the breeding stock each year.

The Advantage of Grading

More attention is being given each year to the question of selling eggs on a graded basis. The outstanding advantage of selling any product on a graded basis is that it enables consumers to select what they really want. The practice of selling on an ungraded basis places all producers on a common level, and the producer of a low-quality product causes lower prices for those who sell high-quality products.

Lesson No. 5. National Egg Week

M. A. JULL

The humble hen makes a considerable contribution to the Nation's food supply, and she also helps farmers to make a good living.

The poultry industry to-day ranks sixth in importance of all the agricultural industries and its annual farm valuation runs considerably over a billion dollars.

As a tribute to the hen, the National Poultry Council has set aside the first week in May as national egg week.

Eggs seem to have been generously supplied by nature with the different food elements necessary to provide a valuable food for man.

Composition of Eggs

The edible portion of whole egg contains somewhat over 13 per cent protein, the white containing over 12 per cent, and the yolk almost 16 per cent.

The yolk also contains 23 per cent fat, 11 per cent lecithin (a phosphorus compound), and 3 per cent salts, of which the most important are those of calcium and iron.

The yolk is relatively rich in fat-soluble vitamin A, the water-soluble vitamin B, and the antirachitic vitamin D.

Eggs Easily Digested

Eggs rank high in respect to their completeness of digestion, whether eaten raw or cooked, with the advantage on the side of the slightly cooked egg, especially in the case of egg white.

The manner and extent of cooking may influence the rate but apparently not the thoroughness of digestion.

The excellent digestibility of eggs gives them a special value in the diet of children and invalids.

Energy Value in the Yolk

The energy value of eggs is obtained largely from the fat of the yolk. As sources of energy in the human diet, eggs compare very favorably with other staple articles of food.

The energy value of the whole egg has been shown to average 670 calories a pound, the yolk 1,645 calories, and the white 230 calories.

Protein supplies nitrogen needed to build and repair the body tissues. Foods of animal origin, such as milk, eggs, meat, and fish, are in general more valuable for this purpose than are those of vegetable origin.

Egg Yolk, a Valuable Source of Iron

Egg yolks are so valuable as a source of iron that they are often included in diets for that particular reason.

Iron is an important element in the red blood corpuscles. There is especial need of iron in the right chemical form for infants and children.

The egg yolk is one of the best-known sources of iron in foods, and physicians in charge of infant feeding frequently recommend the inclusion of raw eggs in the milk diet as early as six months of age.

Sunshine, leafy vegetables, eggs, and cod-liver oil are four sources of vitamin D, access to which on the part of the developing child will promote the development of normal bone and teeth.

Many physicians now recommend the feeding of cod-liver oil or egg yolk or both to all infants, commencing in many cases as early as two months. Such a practice is particularly important for babies born in the larger cities, where access to sunshine is frequently limited, and in the case of babies born in the fall and winter months, because it is now known that the sun's rays at this time of the year are not nearly so effective in preventing rickets as during the summer months.

Lesson No. 6. Preserving Eggs

ALFRED R. LEE

Eggs for home use may be preserved to advantage in the spring, when they are about 30 cents a dozen, for use in the following fall and winter when fresh eggs bring from 60 to 90 cents a dozen.

Preserved eggs or those which have been kept in cold storage lack some of the quality of fresh eggs but are economical in winter, when fresh eggs are high in price and are not produced in sufficient quantity.

Preserved eggs should never be offered for sale as fresh eggs.

Cold storage is the method used in keeping eggs commercially, and when properly handled it keeps eggs in excellent condition.

Preserve Only Fresh, Clean, Uncracked Eggs

Only fresh, clean eggs should be preserved.

Eggs laid during the spring are best for this purpose especially when 'infertile.

When an egg is only slightly soiled, a cloth dampened with vinegar may be used to remove such stains.

Under no circumstances should badly soiled or cracked eggs be used for preserving. If put into the jar while dirty they will spoil; nor should they be washed since that removes a protective coating which tends to prevent spoiling.

Water-Glass Method

A good method for the preservation of eggs is the use of water glass (sodium silicate).

If the price of water glass is about 30 cents a quart, eggs may be preserved at a cost for the solution of approximately 2 cents a dozen.

It is not desirable to use the water-glass solution a second time, unless it has remained clear.

Use 1 quart of sodium silicate to 9 quarts of water that has been boiled and cooled.

Place the mixture in a 5-gallon crock or jar that has been thoroughly cleaned and scalded. This will be sufficient to preserve 15 dozen eggs and will serve as a guide for the quantity needed to preserve larger numbers of eggs.

Galvanized containers may also be used for preserving eggs in water glass, but they are not suitable for limewater solution.

If sufficient eggs are not obtainable when the solution is first made, additional eggs may be added from time to time.

Be careful to allow at least two inches of the solution to cover the eggs at all times.

Place the crock containing the preserved eggs in a cool, dry place, well covered to prevent evaporation. Waxed paper tied over and around the top of the crock will answer this purpose.

Lime Method

Another good method for preserving eggs for home use is the lime method. This is especially useful on farms where lime is used for other purposes.

Dissolve 2 or 3 pounds of unslaked lime in 5 gallons of water that has previously been boiled and allowed to cool, and allow the mixture to stand until the lime settles and the liquid is clear.

Place clean, fresh eggs in a clean earthenware crock or jar and pour the clear limewater into the vessel until the eggs are covered. At least 2 inches of the solution should cover the top layer of eggs.

One-fourth of a pound of salt may be used with the lime, but the salt is not essential.

Using Preserved Eggs

Fresh, clean eggs, properly preserved, can be used satisfactorily for all purposes in cooking and for the table.

When eggs preserved in water glass are to be boiled, a small hole should be made in the shell with a pin at the large end before placing them in the water. This is done to allow the air in the egg to escape when heated so as to prevent cracking.

Lesson No. 7. Marketing Broilers

ALFRED R. LEE

Considerable interest has been stimulated in the production and marketing of winter broilers by the recently improved methods of successfully feeding and brooding chickens confined indoors.

Chickens may be grown to market age while still confined to the brooder house by adding cod-liver oil to the ration and by supplying yellow corn meal and the proper minerals in the growing ration.

The increasing interest in hatching chicks early for the production of summer and fall layers produces a crop of early spring cockerels which are marketed as broilers.

Best Prices in February and March

Broilers are young chickens, usually males, weighing from three-fourth to 2½ pounds each, the smaller sizes often being called squab broilers.

Early broilers—those coming on the market in February and March—bring prices per pound almost twice those paid for broilers during the summer and fall, prices declining rapidly during the spring months.

Fattening for Market

The market condition of broilers may be improved by the use of a fattening ration for two or three weeks before marketing.

Broilers will weigh about 2 pounds when they are from 9 to 13 weeks old.

In many cases the cockerels are kept in the pens with the pullets and fed the regular growing rations until they are marketed.

If cod-liver oil is used it should be omitted from the ration two weeks before the broilers are marketed.

The cockerels may be separated from the pullets and either pen-fattened or crate-fattened. A fattening mash may be made of 3 parts of corn meal and 1 part of middlings by weight, fed with skim milk or buttermilk.

Fattening is most profitable for broilers which are dressed and sold direct to the consumer.

Usually Marketed Alive

Most broilers are marketed alive and shipped either to market poultry dealers or direct to hotels and meat markets.

The chickens are shipped to market in wooden or wire shipping coops, each with a capacity of from 20 to 22 chickens.

Shipment should be made as rapidly as possible to reduce the shrinkage which occurs during shipment.

In most markets certain days of the week are more favorable for the sale of poultry than others.

The best time of day to forward a shipment depends upon the length of the journey and the time it will arrive on the market. Early morning is usually the best time for a shipment to arrive.

The best prices are received for broilers which are dressed and sold direct to the consumer.

It is important that poultry to be dressed have empty crops when killed. No solid feed should be given for 24 hours before slaughter, but plenty of water should be provided.

Killing and Picking

Market poultry is killed by hanging the bird up at a convenient height for picking and cutting the jugular vein in the throat just below the base of the skull.

If the birds are to be scald picked they may be stunned by a blow on the back of the head with a short club before they are bled, or the knife may be thrust into the base of the brain through the mouth.

When fowls are scald picked it is a common practice to "plump" them by dipping the birds first in hot water and then in cold water as soon as they are plucked.

Dry picking is more difficult than scald picking but is required in some markets and produces a better appearing broiler.

In dry picking, as soon as the cut has been made for bleeding, the point of the knife is immediately plunged through the roof of the mouth into the brain.

As soon as the birds are plucked, whether by scalding or dry picking, they should be cooled as promptly as possible.

Lesson No. 8. Capons and Caponizing

J. P. QUINN

The quality of capon meat is so generally recognized and appreciated that capons bring a much higher price per pound than other chickens.

Average prices per pound for capons, fryers, roasters, fowls, and old cocks in the New York market from January 1, 1926 to January 1, 1927 were as follows:

Capons, 41.23 cents; fryers, 32.94 cents; roasters, 32.73 cents; fowls, 29.23 cents; old cocks, 21.80 cents.

Large capons usually bring the best prices. The range in price from about 30 cents per pound for small capons sold in the New York market to more than 50 cents per pound for the largest size and best quality indicates the importance of using a large breed and growing out the birds well.

Desirable Breeds for Caponizing

The American and Asiatic breeds and crossbred varieties of the same are most popular.

Yellow skin and legs add attractiveness and salability.

Some of the English breeds, such as the Orpington, make desirable capons, except that white skin and legs are not in favor in this country.

In New England the Light Brahma was formerly used extensively in crosses with White and Barred Rocks, but vigorous strains of these latter breeds have now almost entirely supplanted the crossbreds.

The Rhode Island Red or White Wyandotte makes a satisfactory capon.

Feeding the Capons

Early hatched chicks are most suitable for caponizing and the operation should be performed at from 2 to 3½ months of age, or when weights are from 1½ to 2½ pounds.

Starvation of the cockerels for from 24 to 36 hours should precede the operation, but it is believed unnecessary to withhold water during this time.

Capons should be supplied with a good growing ration and allowed the freedom of a green range for most rapid, economical growth.

During the last month or six weeks, larger amounts of yellow corn should be added to the mash until the birds are on a full fattening ration. Probably the most practical place to fatten capons is on the range where they have been grown.

Capons are usually not marketed until Christmas and are often held until January, February, or March.

Several types of caponizing instruments are used successfully. These are illustrated in the pages of Farmers' Bulletin 849, Capons and Caponizing, where the details of the operation itself and the care of the fowls afterwards are briefly discussed.

Dressing Capons for Market

Capons, properly dressed for market, present a quite distinctive appearance.

All head, neck, and tail feathers and part of the back and wing feathers are left on. This plumage and the typical head distinguish the capon from other classes of market poultry.

The carcass is dry picked, of course, and care must be used in picking to prevent tearing the skin.

The fattened capon will not bring highest prices unless the carcass is dressed according to trade standards and possesses the smooth, plump, yellow-skinned exterior so well entrenched in popular favor.

Before shipping, the carcasses should be thoroughly cooled so that the animal heat is entirely removed. They can be packed in barrels or in boxes of one dozen each.

A Profitable Farm Side Line

The profits from well-managed capon production are undoubtedly quite satisfactory.

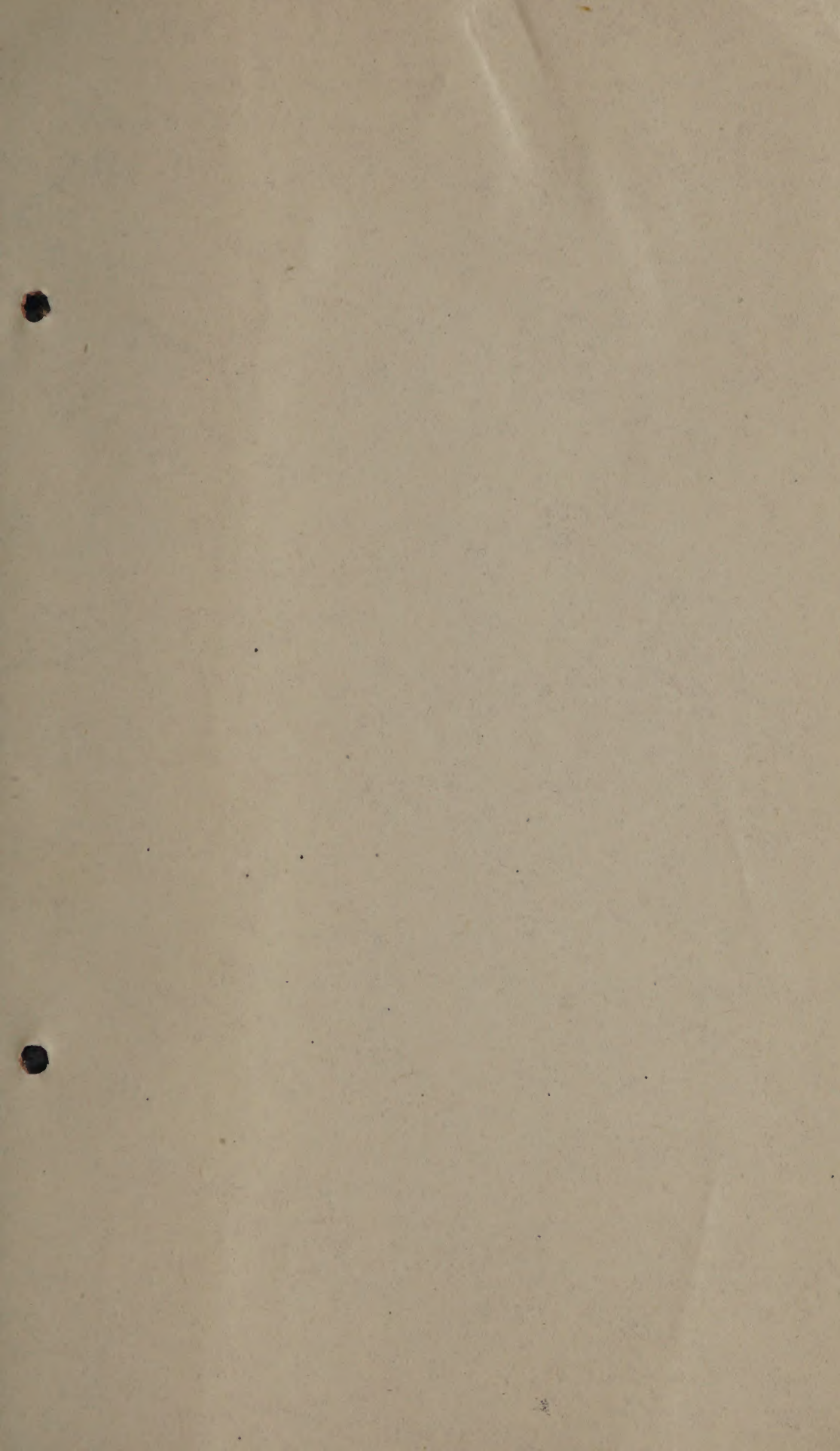
On the general farm, where ample range provides ideal growing conditions and where a home-grown supply of feed is available, the growing of capons is a

sound and profitable side line. Fresh meat of the best quality is provided for the home table and any surplus can usually be marketed locally at good prices.

If the past is any criterion, the keen demand for fat capons in the large city markets will continue to grow with the increased purchasing power of the buying public.

Poultry meat, in composition and nutritive value, compares favorably with other lean meats. Moreover, it is easily digested and consequently considered particularly suitable for invalids and children. Add the attractive appearance and delicate flavor of the capon, and there is an appetizing appeal difficult to resist.






and in the case of the latter, the only way to avoid this is to use a very large amount of the drug, which is not only wasteful but also dangerous.

The second method is to use a very small amount of the drug, which is not only wasteful but also dangerous.

The third method is to use a very small amount of the drug, which is not only wasteful but also dangerous.

1-NOON FARM FLASHES
2-U.S. FARM SCHOOL
3-HOUSEKEEPERS' CH
4-SPECIAL FEATURES
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- WORLD
61/34
- PACIFIC
HAY AND PASTURES
COTTON
CORN, WHEAT AND MEAT
DRY LAND RANGELAND AND PASTURES